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ABSTRACT

As one in a series of test item collections developed by the Assessment and Evaluation Unit of the Directorate of Studies, items are made available to teachers for the construction of unit tests or term examinations or as a basis for class discussion. Each collection was reviewed for content validity and reliability. The test items meet syllabus content and aims best suited to multiple choice questions, but teachers are meant to base the use of the test items on student ability and the particular program objectives in grades 7 through 10. The test items in chemistry are presented in categories including states of matter, atomic structure and elements, separations and mixtures, and solutions. Further sections concern acids and bases, chemical indicators and pH. The activity series of metals, electrochemistry, formulas and equations, and general chemistry test items complete the volume. There are 336 test items. Answers are provided with each item, with drawings and diagrams illustrating many questions. (CM)

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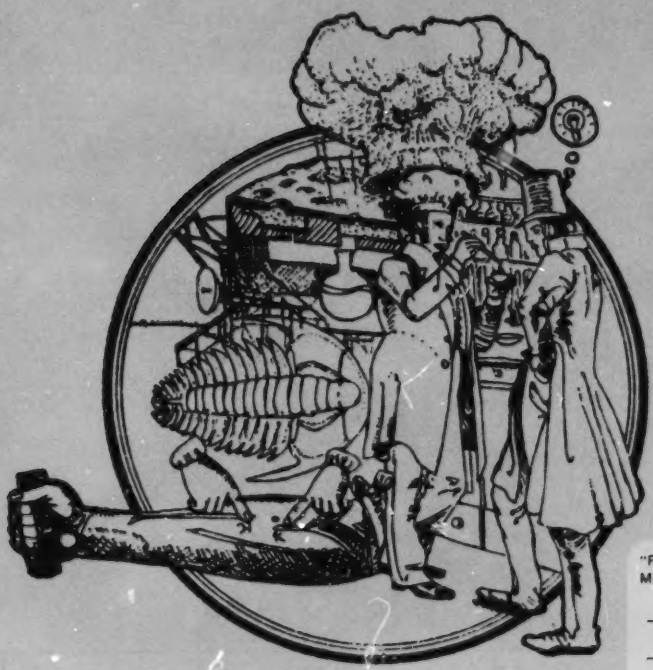

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A COLLECTION OF MULTIPLE CHOICE TEST ITEMS RELATING MAINLY TO

CHEMISTRY

TM 820 317

VOLUME EIGHTEEN OF THE SCIENCE LIBRARY OF TEST ITEMS

ISBN - 0 - 7240 - 5829 - X

VOLUME EIGHTEEN OF THE
SCIENCE LIBRARY OF TEST ITEMS

CHEMISTRY

Also in this series.....

Volume 17	BIOLOGY
Volume 19	GEOLOGY
Volume 20	PHYSICS (1)
Volume 21	PHYSICS (2)
Volume 22	SKILLS

Produced by the
School Certificate Development Unit
Directorate of Studies
Department of Education
New South Wales
1981

Introduction

This volume of test items contains all items currently available in the Science Library of multiple choice items relating to Chemistry. It includes all relevant items from the initial two productions in this series, namely, volumes 1 and 2.

Chemistry, more than the other branches of Science has lost more items in the pretesting program. The review and editorial committees feel that this is possibly due to the more specific nature of these questions. Many which didn't survive to be in this volume were directly related to very specific areas of chemical knowledge such as the preparation and properties of common gases, and types of chemical bonding.

This, in turn, may be a comment on current teaching practises. However, the completeness of a collection such as this, relies on feedback from teachers. So, if you have an area of chemistry in your teaching programs which is not covered by the item collection, write and let us know about it.

Or send some items in - you too can join the writing team. Send all your cards and letters to:

The Subject Officer (Science),
School Certificate Development Unit,
P.O. Box 460,
NORTH SYDNEY. 2060.

Acknowledgements

Many teachers have been involved in developing the library of test items. As with any list of credits, there will always be some who are inadvertently overlooked. To these we extend our apologies.

Those who appear in our files, in alphabetical order, appear in the list below. To these, our thanks and appreciation for work done and the hope that we will continue to receive your support in the future:

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And a special thanks to the girls at S.C.D.U. who have typed without (audible) complaint as we have constantly changed question after question.

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SHARON WEBB
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Brian SHADWICK
Jim STAMELL

DEVELOPMENT OF THE LIBRARY

This collection of material is intended as a resource to assist teachers to implement and evaluate courses in the first four years of secondary school.

Because the questions were submitted by classroom teachers from both Government and non-Government schools in all parts of the State, they constitute a cross-section of the ideas which currently pervade classroom practice.

To ensure quality in the collection, only those items which satisfied several quality control checks have been included. Foremost among these were:

(i) inspection by a panel of experienced, practising teachers;

(ii) a pretest with a representative selection of Years 7-10 students.

As well as sharing in the general editing and reviewing functions, the review panels checked each item for *content validity*. The pretest was used to establish the *efficiency* of the items as measuring instruments. Three of the major statistical criteria used were:

(i) Item Facility: The facility index measures the proportion of the sample candidature who answered the question correctly. All items in this collection have a facility index between 0.30 and 0.90.

(ii) Item Discrimination: This index measures the degree to which success on the item is correlated with success on the total test of which the item is a part. A commonly used index of discrimination is the point-biserial correlation coefficient. Every item in this collection attained a point-biserial correlation coefficient of at least 0.20. This means that on the pretest, each item added significantly to the total score of information about the relative achievement of the candidature.

(iii) Distractor Efficiency: With each item, each distractor was chosen by at least 5% of the total candidature, except in the case of very easy items, where an even spread of respondents was sought.

For the test to be reliable, many features apart from these three must be considered. However, the proven quality of these items, as measured by these three criteria, makes it highly likely that any test chosen from this collection, and administered to *appropriate* classes, will be a more reliable instrument than teachers could normally produce without this assistance.

USING THE COLLECTION

Items in this collection may be reproduced for classroom use in any form desired by the teacher. To facilitate the preparation of printing masters particular attention has been given to both the diagrams and the layout of the items.

To assist the teacher, the items have been classified according to the content being tested and two pieces of information are provided:

(i) the key (or correct option), and;

(ii) the difficulty rating (1-5), which is based on the data obtained during the pre-testing program. A question rated "1" was correctly answered by some 30-40% of students, while "5" indicates a correct response by 80-90% of students in the pre-test sample. Recent investigations have shown that while this information is useful as a general guide, item difficulties vary greatly when items are given to classes who have recently studied the material covered in given items. The ratings should not be confused with norms or goals: they are merely useful guidelines for teachers.

It is suggested that items might be used for the following purposes:

1. As a source of items for short unit tests.
2. As a source of items for term tests.
3. As a source of ideas for in-school item construction.
4. As a basis for class discussions (it should be noted that stimulus material was NOT designed for use with the overhead projector. The letter size used in typing items would not be legible at more than 4 metres from the screen in an average classroom).

One important warning should be given to all teachers using this collection. Some areas of syllabus content and some syllabus aims are better suited to testing with multiple choice items than others. Consequently, this collection is unlikely to be balanced in its coverage. In addition, the inclusion of an item is not intended to imply that a particular piece of content or teaching strategy has a place in the curriculum. The final selection must lie with the teacher in the classroom who knows the interests and abilities of his students.

Comments, criticisms and suggestions from teachers are welcome. All correspondence should be addressed to :

The Subject Officer (Science),
School Certificate Development Unit,
P.O. Box 460,
NORTH SYDNEY. 2060.

CONTENTS

As with the other volumes in this series the questions contained herein are grouped into broad categories only. There is obvious overlap between some categories and teachers will have more success locating specific topic areas if they familiarise themselves with the collection as a whole.

The last section "Leftovers" contains items which didn't fit logically into the previous groupings. There were also insufficient of them to subdivide them any further, so, if you can't find it anywhere else - look in the leftovers.

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STATES OF MATTER

The state of matter in which a substance has definite volume but takes the shape of the container in which it is placed is

B3

A. gas.
B. liquid.
C. solid.
D. both liquid and gas.

1

The state of matter in which a measured amount of a substance has neither a definite shape nor size is

A4

A. gas.
B. liquid.
C. liquid and gas.
D. solid and liquid.

2

Particles vibrate more freely in the liquid state than in the solid state of the same substance.
Our best evidence for this statement is

A1

A. our observation of the behaviour of heated substances.
B. our ability to observe this behaviour.
C. the necessity to agree with the particle theory.
D. the fact that solids are incompressible.

3

A gas is a substance

A3

A. in which the particles are further apart than in liquids.
B. in which the particles are smaller than those in solids.
C. which is usually colourless and less dense than air.
D. which is often odourless and diffuses slowly.

4

A substance in which the particles can vibrate without moving past one another is a

C3

A. gas. B. liquid. C. solid. D. vapour.

5

Here are three things which can be observed.

(i) gases exert pressure.
(ii) oxygen passes into the blood.
(iii) water passes into root hairs.

Which scientific concept <u>best</u> explains these?

D3

A. Energy causes change in materials.
B. Matter cannot be created.
C. Energy cannot be created or destroyed.
D. Matter consists of particles in motion.

6

When a sealed container of gas is heated, the pressure increases. This is because the gas molecules become

B3

A. bigger. B. faster. C. heavier. D. denser.

7

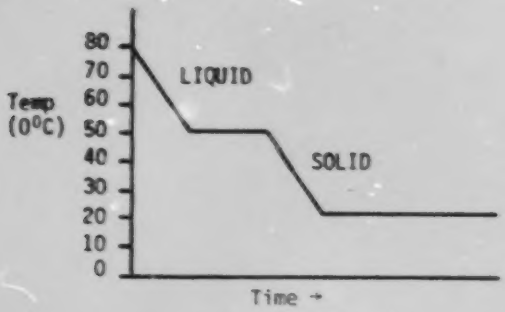
The state of matter in which a substance has both definite shape and size is

B4

A. liquid only.
B. solid only.
C. gas only.
D. both solid and liquid.

8

The graph drawn below shows the temperature of some molten wax as it is gradually cooled to room temperature.

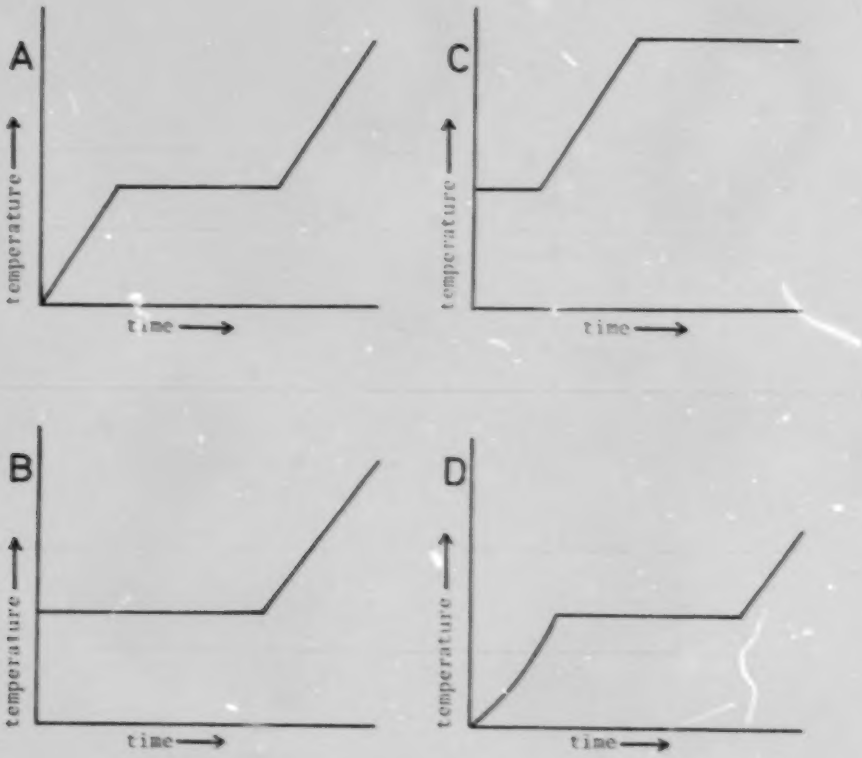


The melting point of the wax is nearest to

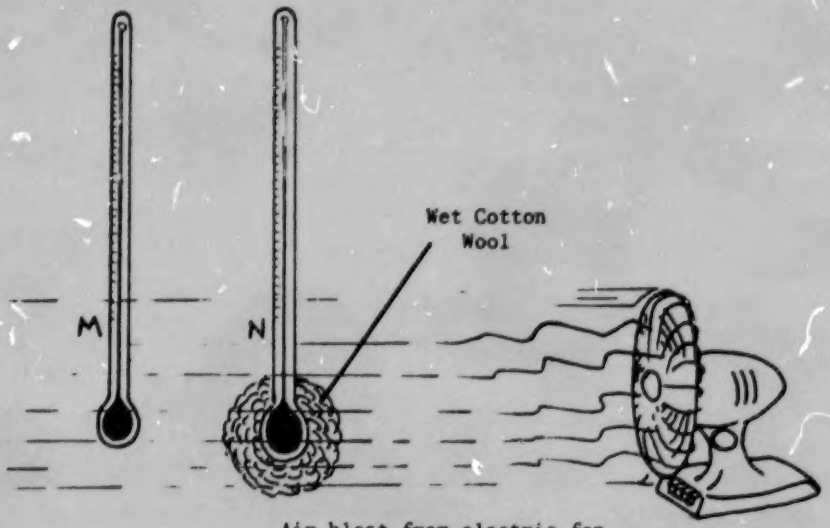
B2 A. 20°C. B. 50°C. C. 75°C. D. 110°C.

9

When ice is heated it melts and its temperature stays the same until all the ice has melted. After that, the temperature of the water increases until the water boils. While the water boils, the temperature stays the same until it has all changed to steam.
Which of the following graphs summarises this information?



The next question refers to the following diagram.

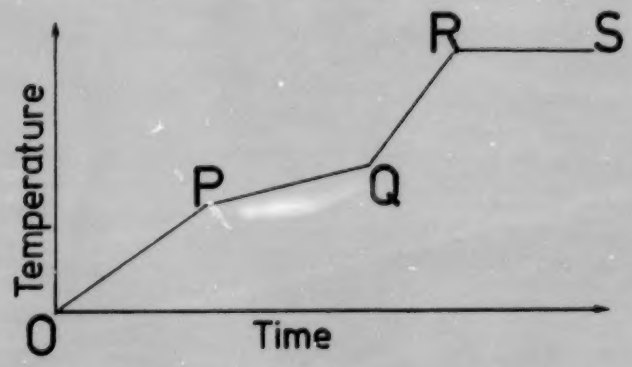


You would expect the mercury

A. to remain the same in M and fall in N.
B. to fall at the same rate in both M and N.
C. to fall faster in M than N.
D3 D. to fall faster in N than M.

11

The next two questions refer to the graph below which shows the changes in temperature when a mixture of two liquids is distilled.



Which section of the graph marks the evaporation of the liquid with the lowest boiling point?

A. OP B. PQ C. QR D. RS

B2. 12

At which point on the graph did distillation of the second liquid start?

A. P B. Q C. R D. S

C1. 13

Evaporation, melting, freezing and condensation

A. are all caused by heating.
B. are all caused by cooling.
C. all form new substances.
D. are all changes of state.

14

Ice melts when heated because

A. the ice particles are given more energy and move more freely.
B. the particles break away from each other and move freely into the air.
C. the ice particles move by convection away from the source of heat.
D. objects always change from solid to liquid states when heated.

15

As boiling water turns to steam, the temperature of the water

A. stays constant.
B. decreases.
C. increases.
D. varies considerably.

16

The water droplets which form on the mirror in a bathroom while someone is taking a shower are formed by

A. condensation.
B. diffusion.
C. evaporation.
D. solidification.

17

When washing dries on a clothes line, the change of state which occurs is

A. condensation.
B. evaporation.
C. sublimation.
D. solidifying.

18

When iodine is heated in a test tube, the iodine

A. turns into a liquid.
B. turns into a gas.
C. turns white.
D. burns.

19

The property of boiling water which allows it to absorb heat without changing its temperature is called

A. assimilation.
B. conduction.
C. latent heat.
D. evaporation.

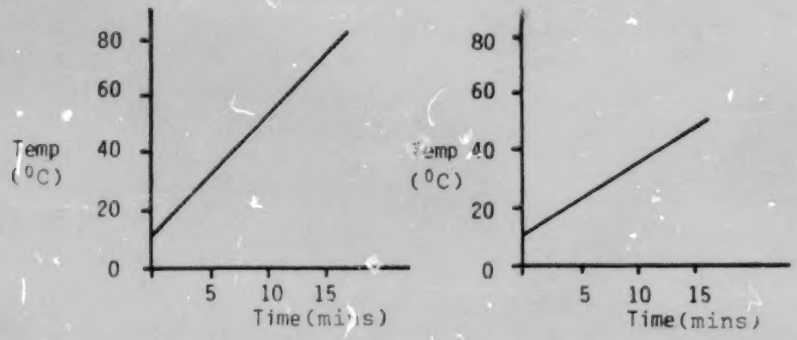
20

Icebergs (frozen fresh water) float in the ocean (salt water). From this it is possible to conclude

A. salt water is less dense than ice.
B. fresh water is less dense than ice.
C. when sea water freezes it loses its salt.
D. ice is not as dense as sea water.

21

The next question refers to the following information.



A student heated two flasks containing water over identical flames. He then measured the temperature of the water at equal time intervals and drew the two graphs shown above.

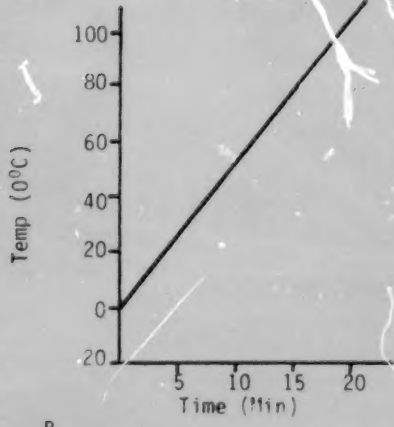
From these graphs we could reasonably conclude that

A. the water in graph I was warmer to begin with.
B. the water represented by graph II heated more rapidly than that represented by graph I.
C. graph I represents a smaller volume of water.
D. the water represented by graph I was heated for a longer period of time.

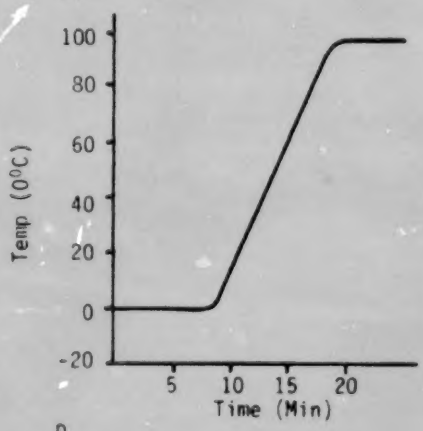
22

Which of the following graphs correctly shows the variation of temperature with time as ice is changed to steam?

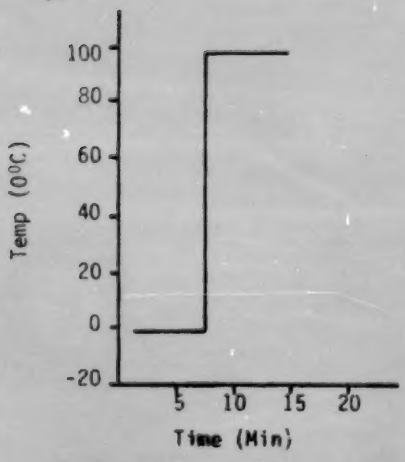
A.



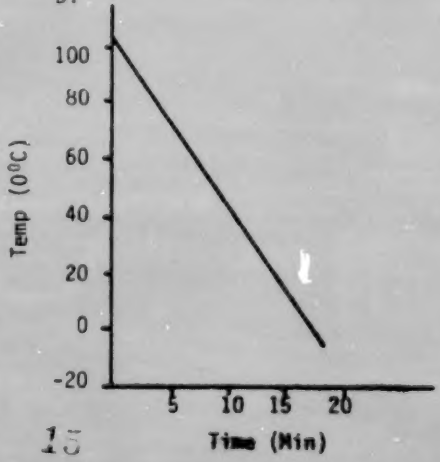
C.



B.



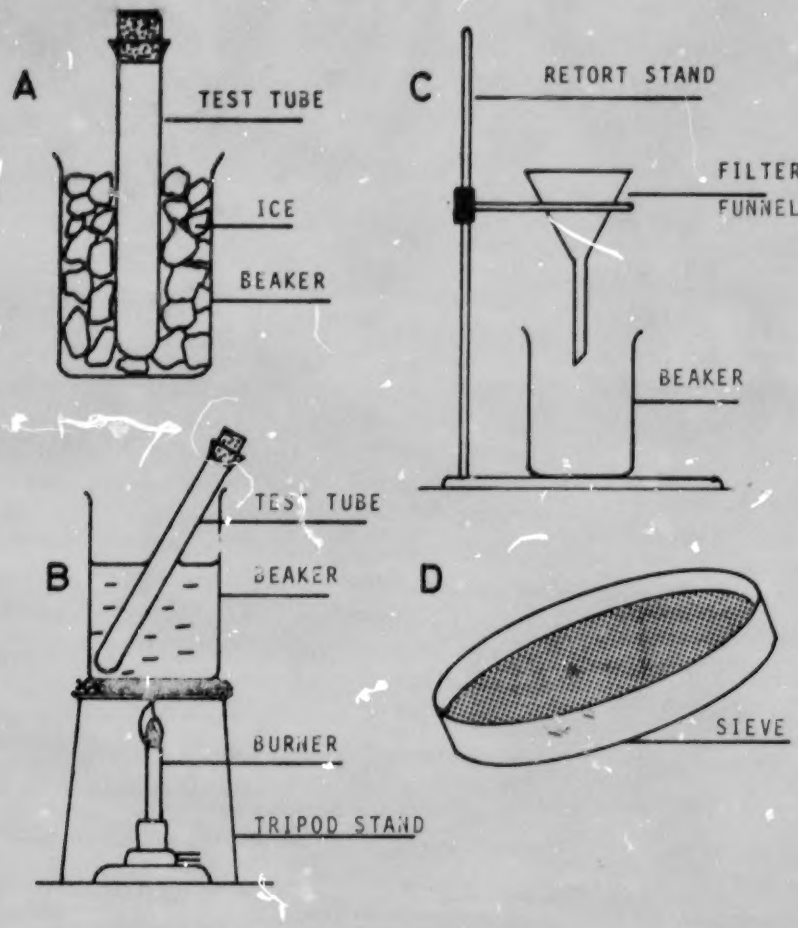
D.



C3

23

If you wanted to change a substance from gas to a liquid, which of the sets of apparatus drawn below would you use?



24

One day Mary was putting the food away after a meal. She put a dish of warm, left-over vegetables into the refrigerator and noticed that the vegetables seemed to steam. She thought this could be explained by the fact that

A. water molecules move faster when they are suddenly heated.
B. cold air holds more moisture than warm air.
C. water changes to vapour as it boils.

D2 D. water vapour changes to water when it is cooled.

25

Diffusion is a process by which the particles of matter in a liquid or gas

A. move faster.
B. move slower.
C. spread out.
C4 D. move closer together.

26

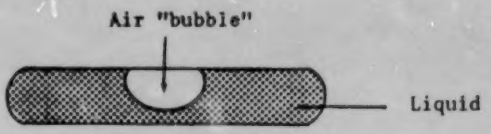
The melting and boiling points of four different substances are given in the table below.

Substance	Melting Point (^{o}C)	Boiling Point (^{o}C)
A	336	decomposes after melting
B	801	1430
C	-78	78
D	-114	-85

C5 Which one of the substances (A, B, C or D) is a liquid at room temperature?

27

The diagram below shows the "bubble" of a spirit level as used by a carpenter.



The carpenter left the level lying in the hot sun for an hour and on picking it up he noticed that the air bubble was smaller. His observation is

A. correct because the liquid expands when heated, but air doesn't.
B. incorrect, because gases expand more than liquids, when heated.
C. correct because liquids are unable to be compressed.

C2 D. incorrect because the bubble is in a sealed container and no expansion would occur.

28

When water in a glass bottle freezes the bottle often bursts. When mercury freezes in a glass thermometer, the bulb of the thermometer does not burst. The most likely explanation is that

A. water and mercury both expand on freezing but water expands more than mercury.
B. the round shape of the thermometer bulb gives it added strength.
C. the bottle breaks because the glass is thicker than the thermometer.

D5 D. water expands on freezing but mercury contracts on freezing.

29

Which of the following is an example of diffusion?

A. Movement of air by wind action.
B. Rain falling from a cloud.
C. Children leaving a classroom.

D3 D. Cooking odours filling a room.

30

Which of the containers below would be the most suitable to keep liquid air in.

A.

C.

B.

D.

31

If solid carbon dioxide (known as "dry ice") is placed in a beaker of water, bubbles are seen rising from the water and white vapours spill out of the beaker and over the desk.

The correct explanation for this effect is

A. the "dry ice" causes the water to boil.
B. the "dry ice" decomposes the water.
C. the water causes the "dry ice" to vaporise.
D. the water decomposes the "dry ice".

C.3

32

(same as Q20 page 11)

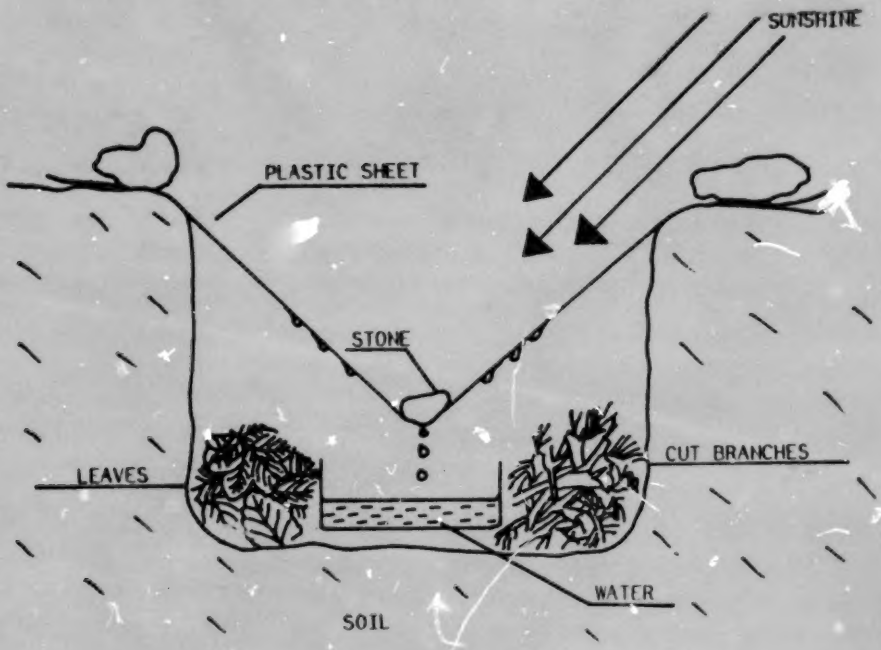
The property of boiling water which allows it to absorb heat without changing its temperature is called

A. assimilation.
B. conduction.
C. latent heat.
D. perfect heating.

C1

33

The diagram below shows a method used to obtain water from leaves and branches as a survival technique in dry regions.



The processes involved in this method of water collection are

A. photosynthesis and transpiration.
B. evaporation and condensation.
C. transpiration and evaporation.
B3 D. evaporation and photosynthesis.

34

On day, as Mary filled the ice cube tray with water and put it in the freezer, she noticed that the water level was just below the top of the tray. Later, when she removed the tray, she noticed that the cubes of ice were bulging out over the top of the tray. Which of the statements below best explains the change?

A. The metal tray became much smaller as it cooled.
B. The water was moving upwards as it froze.
C. Water expands when it changes to ice.
C4 D. The air in the water caused the water to bulge when it froze.

35

Bill noticed that the refrigerator needed defrosting. He asked several people why refrigerators built up this frost. Which of the following explanations accounts for most of the frost?

A. Moisture from the air comes in each time the door is opened, and freezes on the walls.
B. The accumulation of spilled water from the ice cube trays causes it.
C. Moisture leaks through the joints of the piping.
A3 D. Various chemicals inside the refrigerator react to form frost.

36

The next question refers to the following information.

A student mixed together some water and some ice cubes and stirred the mixture until the temperature was 0^0C.
Ten minutes later, when half the ice cubes have melted, you would expect the thermometer reading to be

A. 0^0C. B. 5^0C C. 10^0C. D. room temp.

37

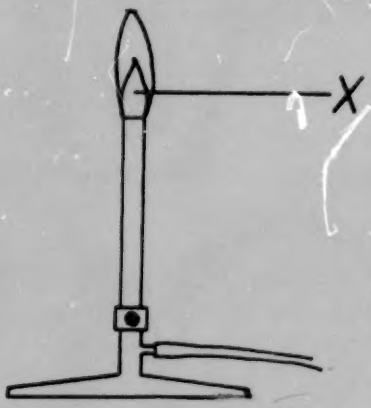
A student placed some water in a beaker on a tripod and heated it until it boiled. The temperature was then 98^0C.
Ten minutes later, when about half of the water has boiled away you would expect the thermometer reading to be closest to

A1 A. 98^0C. B. 100^0C C. 110^0C D. 360^0C.

38

The next question refers to the information below.

The diagram below represents a lighted Bunsen burner.



The part of the flame marked X is the coolest part of the flame. This is because it is

A. only air.
B. unburnt gas.
C. yellow in colour.
B3 D. burning at a lower temperature.

39

ATOMIC STRUCTURE ELEMENTS

The atomic particle with a positive charge is called the

D3
A. electron.
B. molecule.
C. neutron.
D. proton.

40

The atomic particle with no electric charge is called the

C2
A. electron.
B. ion.
C. neutron.
D. proton.

41

The atomic particle with a negative charge is called the

A1
A. electron.
B molecule.
C. neutron.
D. proton.

Hydrogen atoms have only one electron circling the proton in the nucleus. The hydrogen atom is unstable and so tends to form molecules of

B2
A. single hydrogen atoms by gaining an electron.
B. two hydrogen atoms sharing the pair of electrons between them.
C. charged hydrogen atoms, or hydrogen ions.
D. heavy hydrogen atoms because they contain two electrons.

43

The atomic particles which move around the nucleus are called

A
A. electrons.
B. ions.
C. neutrons.
D. protons.

44

The nucleus of an atom contains

B3
A. electrons and protons.
B. protons and neutrons.
C. neutrons and electrons.
D. electrons and ions.

45

One molecule of oxygen consists of two atoms of oxygen joined together. What mass of oxygen atoms is there in 32 grams of oxygen molecules?

C1
A. 2 grams.
B. 16 grams.
C. 32 grams.
D. 64 grams.

46

Which of the following does not exist as molecules?

C1
A. Carbon dioxide.
B. Chlorine.
C. Common salt.
D. Water.

47

Which of the following elements is the most abundant in the Earth's crust?

C2
A. Aluminium.
B. Iron.
C. Oxygen.
D. Silicon.

48

Which group contains only non-metallic elements?

C4
A. Neon, carbon, sodium
B. Iron, carbon, tin.
C. Carbon, oxygen, chlorine.
D. Mercury, hydrogen, helium.

49

This question refers to the list of elements shown below.

ELEMENT	SYMBOL	NUMBER OF NEUTRONS	NUMBER OF PROTONS	ATOMIC WEIGHT	ARRANGEMENT OF ELECTRONS IN ORBITS
LITHIUM	Li	1	3	4	2 : 1
SODIUM	Na	10	11	23	2 : 8 : 1
POTASSIUM	K	20	19	39	2 : 8 : 8 : 1

These elements show almost identical chemical behaviour. Given the fact that the chemical behaviour of an element depends on one of the factors in the table above, which is the most likely?

A. Number of neutrons in the atom.
B. Number of protons in the atom.
C. Atomic weight for each element.
D. Arrangement of electrons in orbits.

D3. 50

The earliest idea about atoms was that they are hard, indivisible balls. As time went on, scientists developed other ideas about what atoms are like. Here are three of them:

1. Atoms have a hard positive nucleus with electrons orbiting around it.
2. Atoms have a nucleus made up of protons and neutrons with electrons orbiting around it.
3. The atom consists of a mixture of protons and electrons.

The most likely order in which these were put forward would be

A. 1, 2, 3.
B. 2, 3, 1.
C. 3, 1, 2.
D. 3, 2, 1.

C3. 51

Which element in the atmosphere causes iron to rust?

A. Carbon dioxide.
B. Hydrogen.
C. Nitrogen.
D. Oxygen.

D3 52

Silver cutlery turns black if left for a long time in a drawer and so must be cleaned before use.
The element, existing in the air as a compound, which causes this is

A. Carbon.
B. Chlorine.
C. Hydrogen.
D. Sulfur.

D1 53

The next three questions refer to this table which shows the numbers of protons, neutrons and electrons in four different atoms.

ATOM	PROTONS	NEUTRONS	ELECTRONS
J	7	8	7
K	7	9	7
L	8	8	8
M	9	9	9

The two atoms which would be isotopes are

A. J and K. B. J and L. C. K and L. D. K and M.

A3. 54

The two atoms with the same mass would be

A. J and K. B. J and L. C. K and L. D. K and M.

C1. 55

In each of the four atoms, the number of protons is the same as the number of electrons. This happens because protons and electrons have

A. opposite charges.
B. the same charge.
C. different mass.
D. the same mass.

A2. 56

The numbers of protons, neutrons, and electrons of four atoms, J, K, L and M, are given below:

atom J has 6 protons, 7 neutrons and 6 electrons,
atom K has 6 protons, 8 neutrons and 6 electrons,
atom L has 7 protons, 8 neutrons and 7 electrons,
atom M has 8 protons, 7 neutrons and 8 electrons.

Which one of these pairs of atoms comprises isotopes of the same element?

A. J and K.
B. K and L.
C. J and M.
D. L and M.

A.4 57

The next three questions refer to the following information.

The table gives the symbol, atomic number and mass number for several elements.

I	II	III	IV
Element	Symbol	Atomic Number (Z)	Mass Number of most Common Isotope (A)
Hydrogen	H	1	1
Helium	He	2	4
Lithium	Li	3	7
Beryllium	Be	4	9
Boron	B	5	11
Carbon	C	6	12

The element which has a mass number of 11 for its most common isotope is

A. Boron. B. Carbon. C. Helium. D. Lithium.

A5. 58

The element containing 4 protons in the nucleus of its most common isotope is

A. Beryllium. B. Boron. C. Helium. D. Lithium.

A2. 59

Which element has 4 neutrons in the nucleus of its most common isotope?

A. Beryllium. B. Boron. C. Helium. D. Lithium.

D3. 60

10 grams of a substance P is added to 50 grams of a liquid Q. A reaction takes place and after the reaction, the resulting solution is weighed and found to weigh 57 grams. This reduction of 3 grams is probably due to

A. crystallization. C. precipitate formation.
B3 B. gas evolution. D. solubility of P in Q. 61

A substance which is composed of different types of atoms always present in the same proportions is

A. an element. C. a solution.
B3 B. a compound. D. a mixture. 62

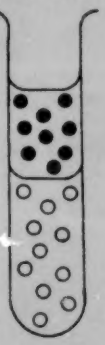
SEPARATIONS
MIXTURES

A student added a small quantity of oil to a test-tube containing water and then placed the test-tube in a centrifuge for several minutes. If water and oil particles are represented as

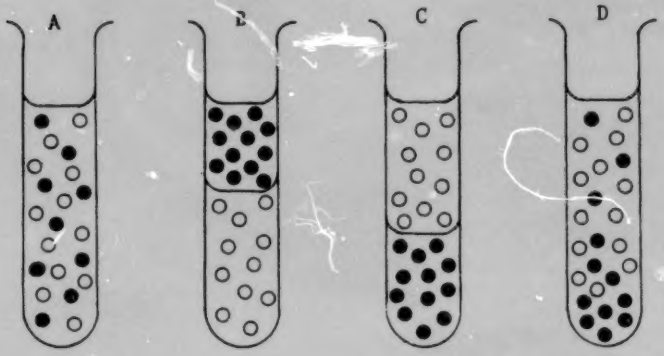
○ = water

● = oil,

before centrifuging



which diagram below best represents the oil-water mixture after centrifuging?



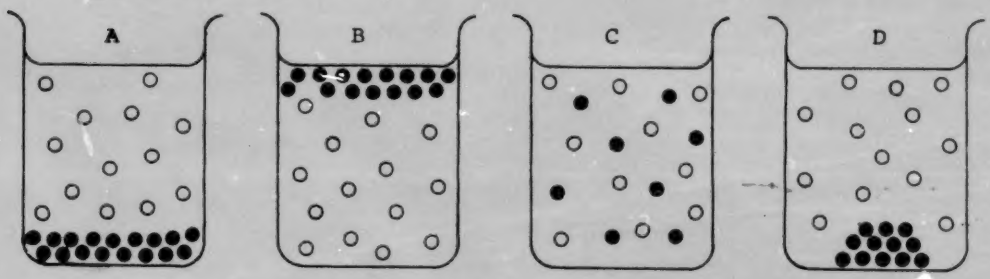
B3

63

Which of the beakers drawn below might contain a suspension?

○ Liquid particles

● Solid particles



C1.

64

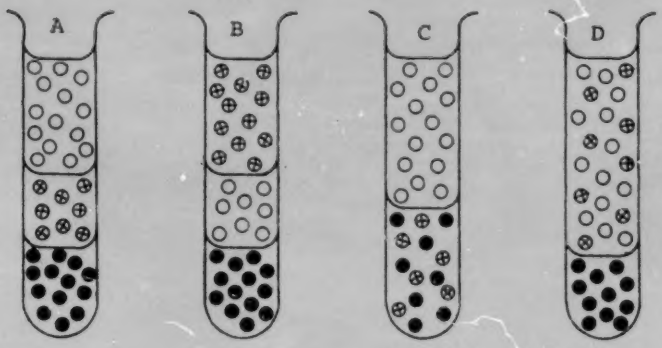
A mixture of water, salt and sand was shaken together in a test tube and the contents allowed to stand.

Which diagram below best represents the form of the resulting mixture?

○ = water particles

⊗ = salt particles

● = sand particles

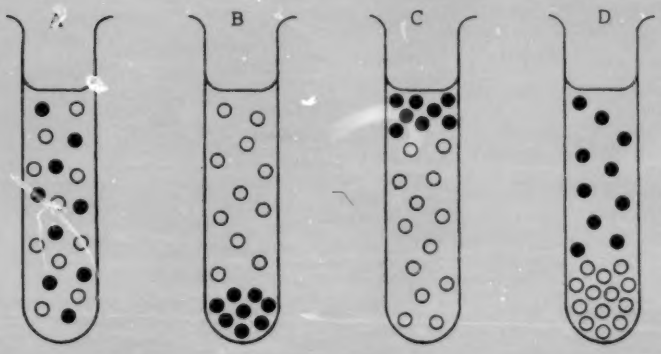


3. 65

Which of the diagrams below gives the best idea of what happens when salt and water are mixed together; if these symbols are used:

○= water particles

●= salt particles



66

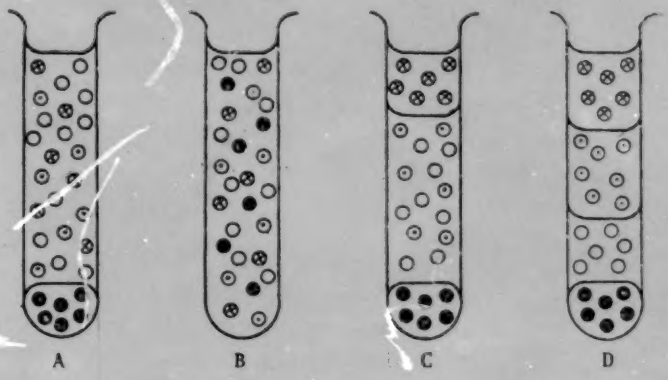
A small quantity of water, mercury, kerosene and methylated spirits were mixed in a test tube. Which diagram below best represents the appearance of the test tube and its contents if

○= water particles

●= mercury particles

⊗= kerosene particles

⊙= methylated spirits particles



C2.

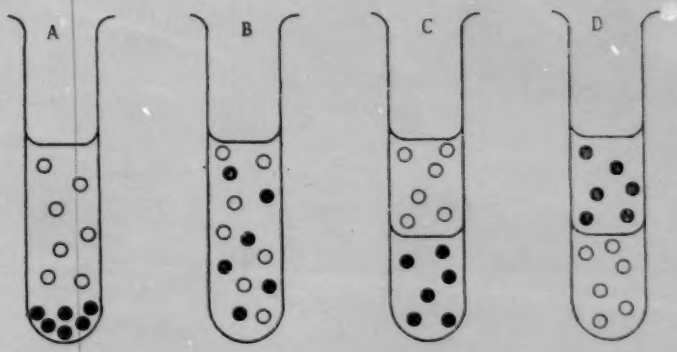
67

A small amount of water and methylated spirits were mixed together and the resulting mixture drawn by a student who represented particles of:

water as ○

methylated spirits as ●

Which test tube drawn below gives a correct representation of the mixture?



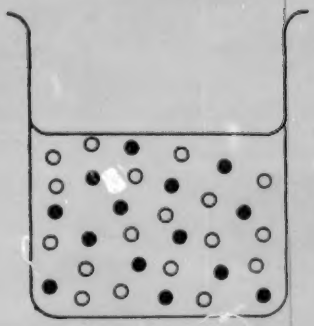
B1.

68

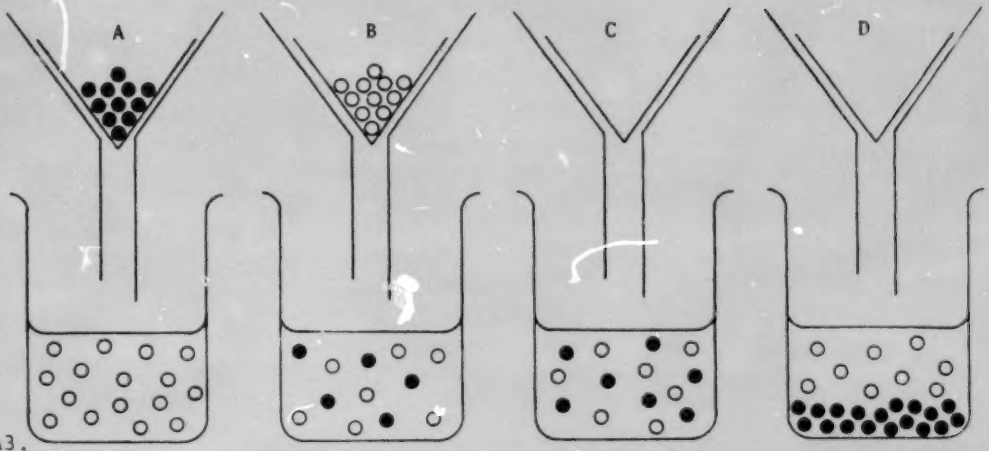
The diagram on the right represents a suspension. Particles of water and suspended solid are shown as:

○= water

●= solid

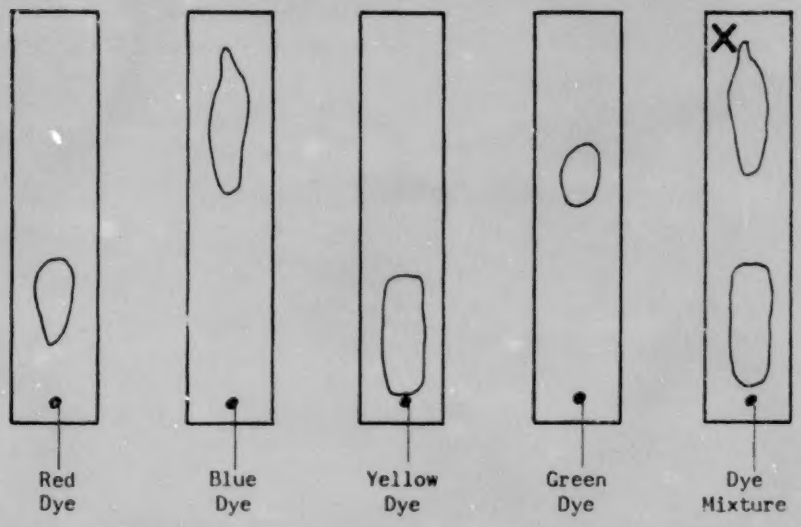


Which diagram below, best represents a filtered suspension.



A3.

It is possible to separate coloured dyes by placing them on strips of absorbent paper. The paper is then soaked in a liquid and different dyes move at different speeds along the paper.
Below are five s[illegible]h pieces of paper on which a student has placed a small sample of different dyes. A strip that he forgot to label is marked X.



The colours mixed in the dye on X would be

A. red and green.
B. blue and yellow.
C. red and yellow.
D. blue and green.

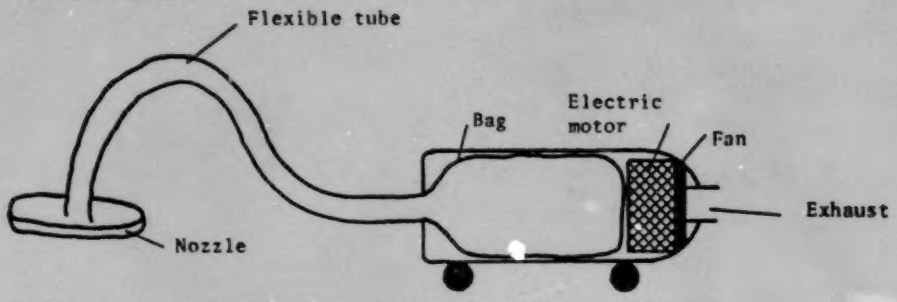
B5. 70

A mixture is composed of 3 substances, X, Y, Z.
X is a liquid of boiling point 100°C, density 1.0 g cm^{-3}
Y is a liquid of boiling point 65°C, density 0.8 g cm^{-3}
Z is a solid of boiling point 1300°C, density 2.0 g cm^{-3}
X and Y are miscible with each other.
Z is freely soluble in both X and Y.
In attempting to isolate X, Y, Z from each other the first step would be to

A. filter the mixture to remove Z.
B. pass the mixture through a narrow based flask to remove the lighter Y by flotation.
C. boil the mixture at 100°C and collect X and Y vapour.
D. boil the mixture at 65°C and collect Y vapour.

D.1 71

This question refers to this simple diagram of a vacuum cleaner.



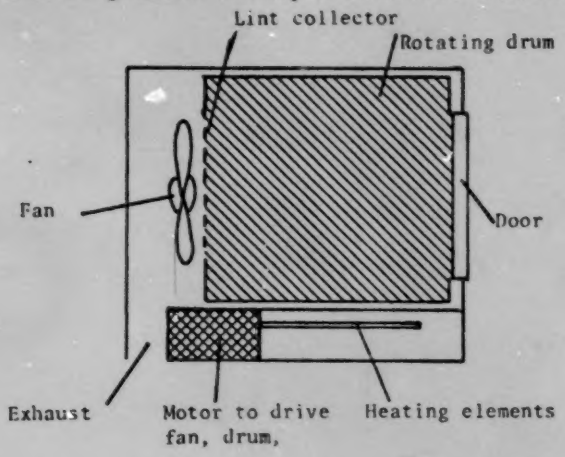
Which part of a vacuum cleaner works in a similar way to the filter paper in a filtration experiment?

A. Nozzle.
B. Flexible tube.
C. Bag.
D. Exhaust.

C.3

72

Consider the diagram of a simple electric clothes dryer.



Which section of the dryer shown above acts similarly to the filter paper in a filtration experiment?

A. Exhaust.
B. Rotating drum.
C. Heating element.
D. Lint collector.

D.5

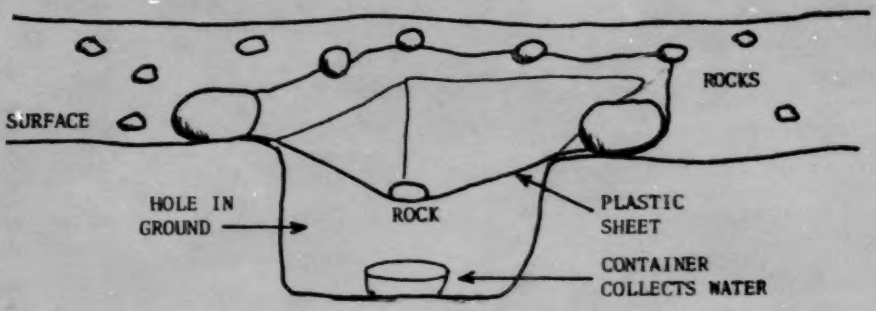
73

An aqueous solution of sodium chloride is evaporated to half its original volume. The concentration of the sodium chloride solution has

A. doubled.
B. halved.
C. remained the same.
D. decreased by an unknown amount.

A.2

Pure water can be obtained from the desert using the following equipment.



This procedure involves which of the following processes?

A. Condensation and filtration.
B. Evaporation and condensation.
C. Evaporation and filtration.
D. Filtration and precipitation.

B3. 75

Which one of the following processes would be the most suitable for obtaining the salt from sea water?

A. Centrifuging.
B. Distillation.
C. Evaporation.
D. Filtration.

C3. 76

Which method would be best to separate a mixture of an insoluble solid and a liquid?

A. Crystallization.
B. Distillation.
C. Evaporation.
D. Filtration.

D3. 77

In which of the household appliances mentioned is the heating element used to separate one substance from another?

A. Pressure cooker.
B. Clothes dryer.
C. Toaster.
D. Electric heater.

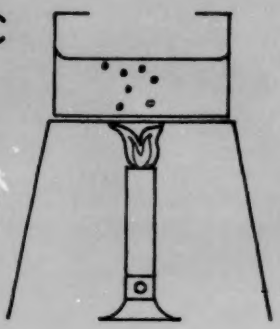
B2. 78

Which of the following heaters would be the most suitable for fractional distillation of petroleum in the laboratory?

A

Bunsen burner

C



Steam Bath

B

Oil Filled Electric Heater

D

Gauze

Meker burner

B1

79

A sample of copper sulfate is contaminated by some charcoal. The best procedure to obtain pure copper sulfate crystals would be to add the mixture to water then

A. distill it followed by crystallization.
B. filter it followed by melting.
C. filter it followed by crystallization.
C3 D. evaporate it followed by freezing.

80

The outsides of two identical containers were dried thoroughly. Ice and water were placed in the first, the second was left empty. A student watching the containers for several minutes noticed that the outside of beaker 1 was moist while beaker 2 was dry. The difference is explained by which observation?

A. carbon dioxide is present in the air.
B. water vapour is less soluble in cold air.
C. cold air around the first contracts and liquefies.
B1 D. the first container is much heavier than the second.

81

Which one of these terms most accurately describes a liquid which extracts the red colouring matter from rose petals?

A. Solute.
B. Solution.
C. Solvent.
D. Saturated solution.

C.3

82

The next four questions refer to the table below.

METHOD	FUNCTION
Filtration	Separates undissolved substances from liquids.
Evaporation	Separates dissolved substances from solution.
Distillation	Separates liquids from dissolved solids.
Crystallization	Separates pure solids from a mixture of dissolved solids.

The method you would use to clear muddy water is

A. filtration.
B. evaporation.
C. distillation.
D. crystallization.

A.3

83

During an experiment a student accidentally dissolved the wrong substance in water. As he needed to use this substance later in the experiment he needed to recover it from the solution. The method he would use is

A. filtration.
B. evaporation.
C. distillation.
D. crystallization.

B.3

84

Copper sulfate when dissolved in water, forms a blue-coloured solution. The method needed to obtain clear water from the copper sulfate solution is

A. filtration.
B. evaporation.
C. distillation.
D. crystallization.

C.2

85

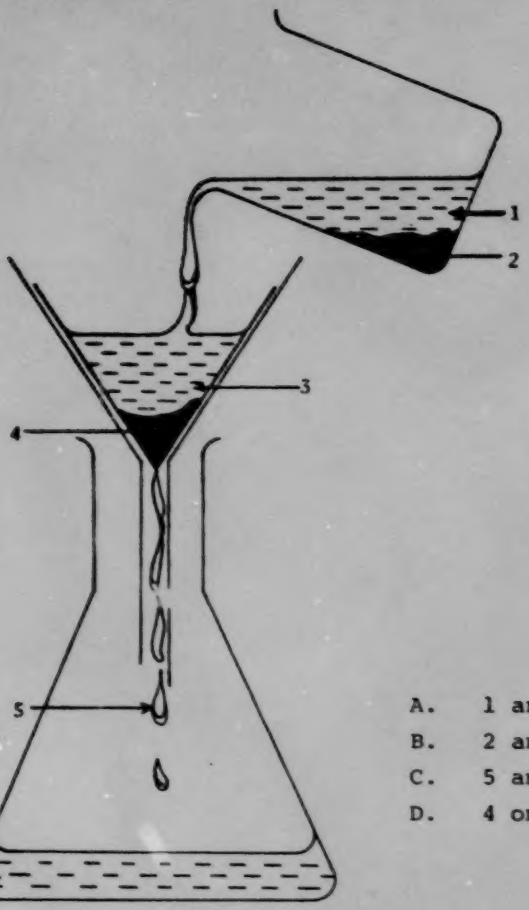
Table salt, sodium chloride, is one of the many salts dissolved in sea water.
The method necessary to separate the sodium chloride from the sea water and the other salts present are

A. filtration and evaporation.
B. evaporation and crystallization.
C. distillation and evaporation.
D. crystallization and filtration.

B.2

86

Which of the substances in the diagram below could be called the filtrate?



C1

A. 1 and 3.
B. 2 and 4.
C. 5 and 6.
D. 4 only.

87

A mixture of paraffin oil, vaseline and kerosene can be separated by distilling them. The property used for separation is a difference in

A2
A. boiling point.
B. density.
C. magnetic properties.
D. solubility.

88

The "process of solution" could be used to separate

A1
A. salt and sand.
B. sugar and salt.
C. methylated spirits and water.
D. petrol and water.

89

A student has 100 mL of sodium chloride solution. She wishes to reduce the volume to 50 mL without losing any of the sodium chloride. To do this, she should heat the solution in

B2
A. a crucible.
B. an evaporating basin.
C. a measuring cylinder.
D. a test tube.

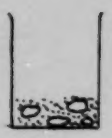
90

To obtain pure water from muddy mineral water the simplest and most effective method would be

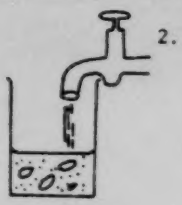
D3
A. crystallization.
B. distillation.
C. evaporation.
D. filtration.

91

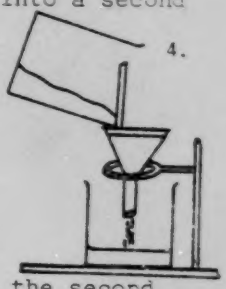
A student mixed some blue copper sulfate crystals and some sand in a beaker.



Then he added some water and stirred vigorously.



Then he poured the contents of the beaker into a second beaker through a filter paper in a funnel.



Which of these should he expect to find in the second beaker?

A. Sand.
B. A clear blue solution.
C. Blue crystals.
D. Pure water.

B.3 92

Three processes used in the chemical separation of a metal from its ore are

1. Reduction - of the metal ore to a metal e.g. by heating with carbon.
2. Concentration - separating the ore from unwanted material e.g. dirt.
3. Refining - purifying the metal.

The order in which these processes are used is

A. 1, 2, 3.
B. 2, 3, 1.
C. 3, 1, 2.
D. 2, 1, 3.

D.3 93

Which household device works on the same principle as a filter paper?

A. Bath plug.
B5 B. Fly screen door.
C. Oven hotplate.
D. Water tap.

94

A difference in boiling point could be used to separate

A. copper sulfate and sodium chloride.
B. hydrogen from water.
C. sand and salt.
D1 D. petrol and water.

95

Centrifuging separates particles because of their different

A. densities.
A1 B. masses.
C. volumes.
D. weights.

96

A mixture of oil and water is separated using a separating funnel. The property used for separation is a difference in

A. boiling point.
B2 B. density.
C. magnetic properties.
D. solubility.

97

Fractional distillation separates substances which have different

A. boiling points.
A2 B. melting points.
C. solubilities.
D. specific gravities.

98

Water can be collected from a solution of salt dissolved in water by

A. crystallizing the salt.
B. evaporating in an evaporating basin.
C. pouring the water off, leaving the salt behind.
D2 D. distilling the solution.

99

Gold can be separated from gravel by panning. The property used for the separation is a difference in

A. boiling point.
B3 B. density.
C. magnetic property.
D. solubility.

100

A mixture of two soluble salts could be separated by dissolving them in water and then

A. crystallizing the least soluble.
B. distilling the mixture.
C. electrolysing the solution.
A1 D. passing the mixture through a filter paper.

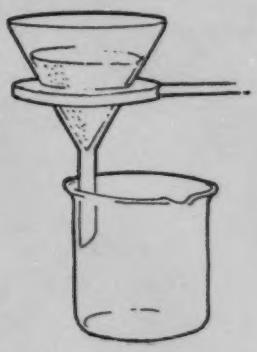
101

The liquid which passes through a filter paper is called the

A. filtrate.
A4 B. residue.
C. solute.
D. solvent.

102

You could use the apparatus in the diagram below to separate



A. salt from sea-water.

B. a metal from its crushed ore.

C. salt from sugar.

D. sand from muddy water.

D4 103

Which process separates particles from one another on the basis of their differing sizes?

A. Centrifuging. C. Filtration.

C3 B. Evaporation. D. Sedimentation. 104

105

Froth flotation is used to separate compounds of lead and zinc from their ores. However, compounds of these metals are very dense. How then, do they float?

A. Mixing them with water dissolves the heavier sections.
B. The particles undergo a loss of weight when immersed in water.
C. The particles are buoyed up by air bubbles.

C1 D. Mixing with kerosene causes the water to sink to the bottom.

Physical separation by filtration makes use of which differing property of the substances involved?

A. boiling point. C. solubility.

C3 B. melting point. D. specific gravity. 106

Which separating process would require most energy?

A. Condensing a vapour into liquid.
B. Decomposing lead oxide.
C. Distilling a mixture of oils.

B1 D. Evaporating copper sulfate solution. 107

A mixture of sand and salt can be separated by putting them into water and filtering the resulting mixture. The property used for the separation is a difference in

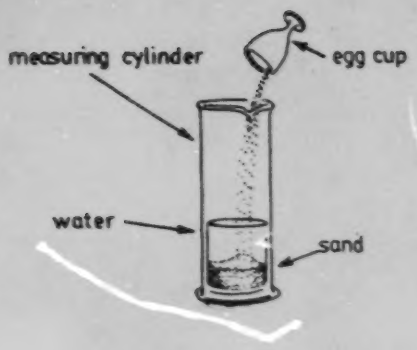
A. boiling point. C. magnetic properties.

D3 B. density. D. solubility. 108

Which commercial separating device works on a different principle to the other three?

A. Clothes dryer. C. Tea strainer.

A2 B. Flour sieve. D Vacuum cleaner. 109



LEVELS IN THE MEASURING CYLINDER	
water only	20 mL
water + sand	35 mL

A student poured exactly one egg-cup full of water into a measuring cylinder and observed that the level came to the 20 mL mark. He then exactly filled the same egg-cup with dry beach sand and added this to the water. He expected the water level to rise another 20 mL to the 40 mL mark. But after stirring the sand and the water, he found the level had risen only to 35 mL. Which of the following is the most likely explanation for the second level being lower than expected?

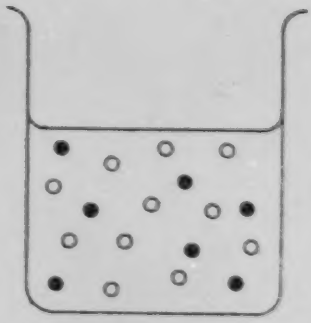
A. Part of the sand dissolved, causing the volume to decrease.
B. The sand shrank when soaked in water.
C. The water contracted when the sand was added to it.
D3 D. Part of the volume of the sand was air space.

110

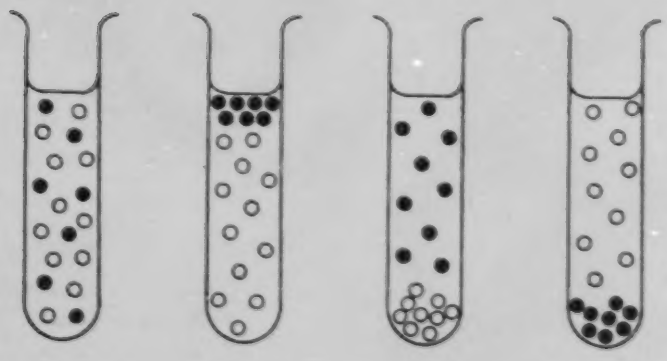
The diagram on the right represents a suspension. Particles of water and suspended solid are shown as

O = water

● = solid



Which diagram below best represents what would happen if the suspension
D3 was centrifuged?

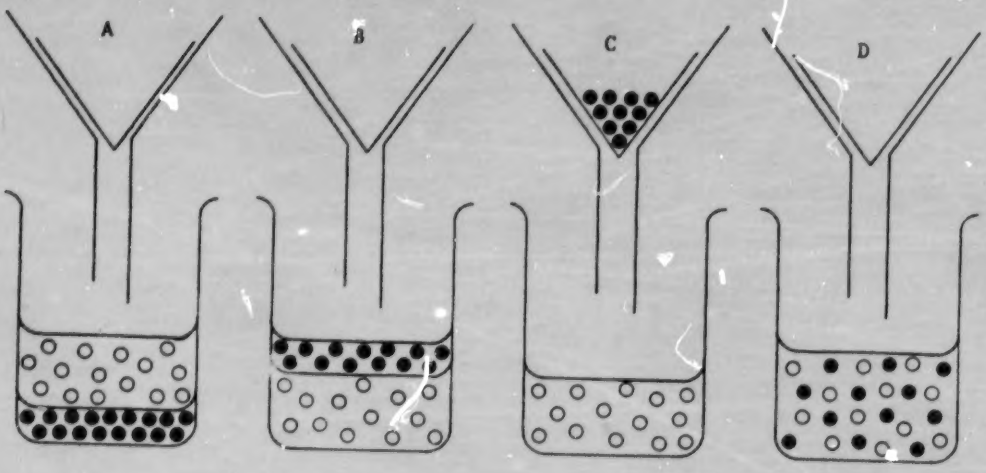


111

A student dissolved a quantity of methylated spirits in water and then filtered the resulting mixture. Which diagram below best represents the result of this filtration if

○= water particles

●= methylated spirits particles



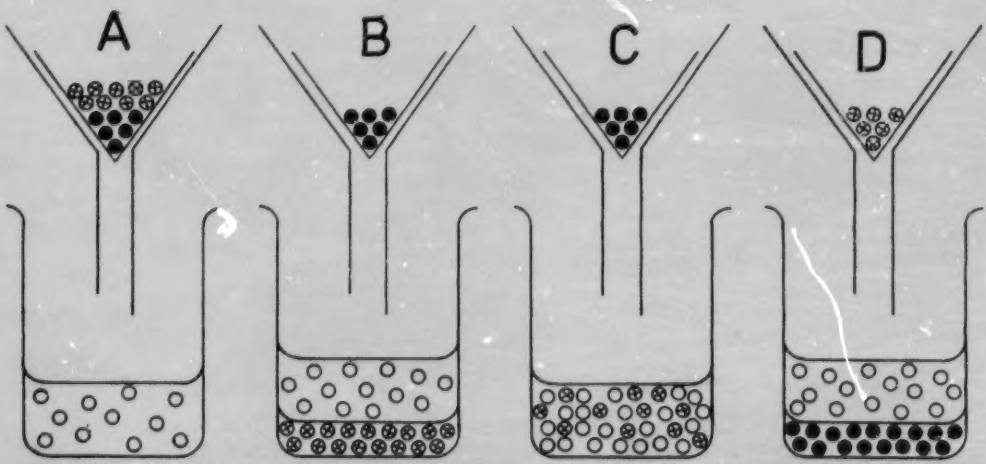
D2. 112

A student mixed together in the same container, quantities of salt, sand, and water, and then filtered the resulting mixture. Which diagram below best represents the filtered mixture of

○ = water particle

⊗ = salt particle

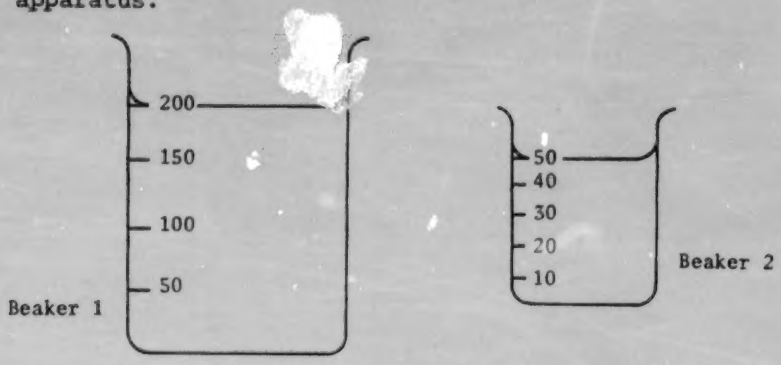
● = sand particle



C3 113

SOLUTIONS

To compare the solubility of two substances a student noted how much of each would dissolve in water using the following apparatus.



He noticed that 15 grams of substance 1 dissolved in the water in beaker 1 and that 5 grams of substance 2 dissolved in the water in beaker 2.

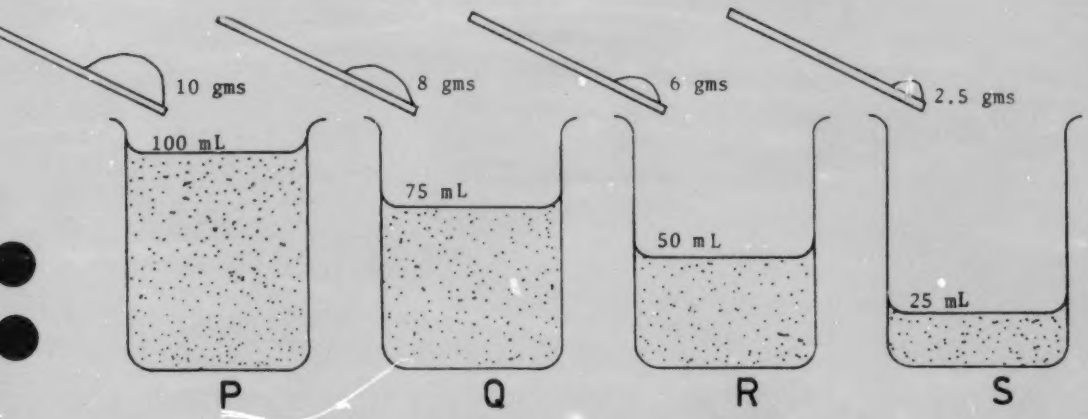
From these results the student could say

A. substance 1 is more soluble than substance 2.
B. substance 2 is more soluble than substance 1.
C. the two substances have equal solubility.
D. nothing because beakers of different sizes have been used.

B1. 114

The concentration of a solution is defined as "the amount, in grams, of solid dissolved in 100 mL of water."

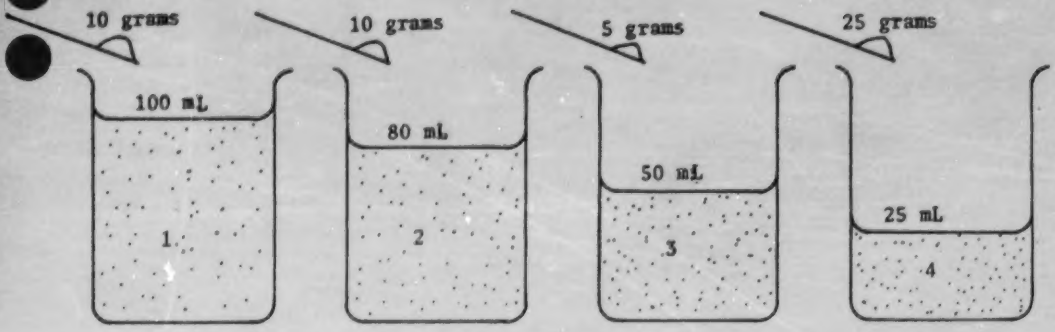
Which two solutions below would be the same concentration?



A. P and Q. B. Q and R. C. R and S. D. S and P.

D4. 115

Four solutions were made using the amounts of water and salt shown below.



Which statement, referring to these solutions, is correct?

Solution(s)

A. 2 is the most dilute.
B. 1 and 3 have equal concentrations.
C. 1 is the most concentrated.
D. 4 is five times as concentrated as solution 3.

B3.

116

Which one of the following four solutions of a salt in water is the most concentrated?

A. 11 g of salt dissolved in 10 mL of water.
B. 9 g of salt dissolved in 10 mL of water.
C. 7 g of salt dissolved in 5 mL of water.
D. 5 g of salt dissolved in 5 mL of water.

C.3

117

The solubility of potassium nitrate is
40 g per 100 g of water at 20°C

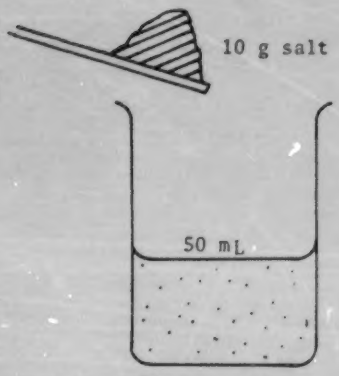
50 g of potassium nitrate was added to a beaker containing 100 g of water at 20°C and stirred until the solution was saturated. The mass of undissolved potassium nitrate at 20°C is

A. 10 g.
B. 20 g.
C. 30 g.
D. 40 g.

A.3

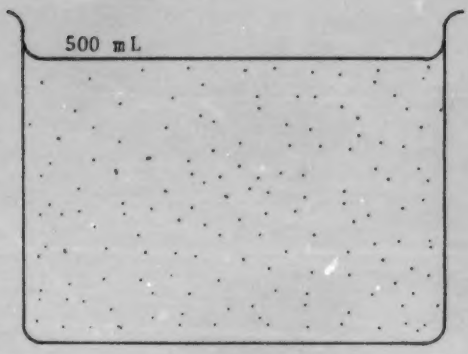
118

A student dissolved 10 grams of salt in 50 mL of water.

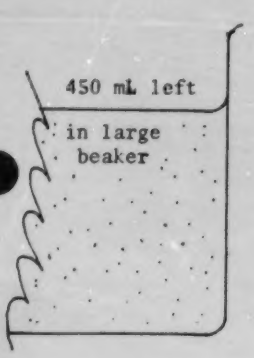


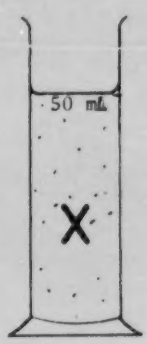
+ 450 mL water

He then put the solution in a larger beaker and added 450 mL of water to a total of 500 mL.



From the large beaker he then poured off 50 mL into a small cylinder.





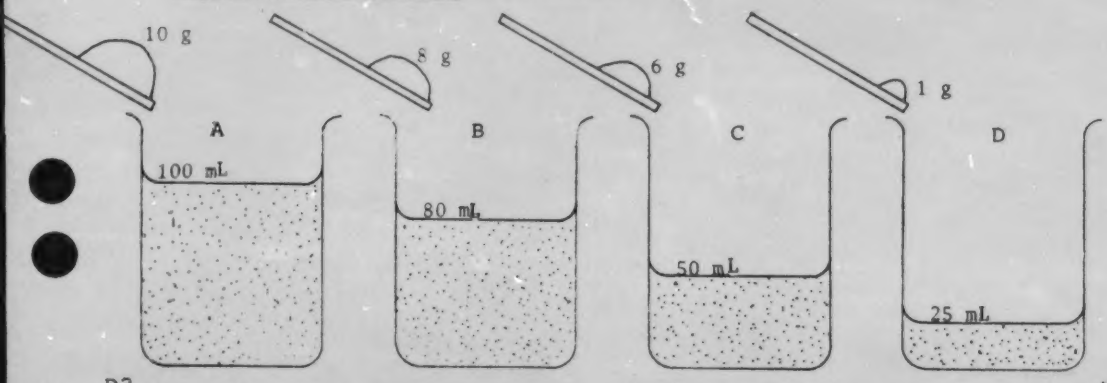
How much salt would be dissolved in the 50 mL of solution in the cylinder X?

A. 0 g.
B. 1 g.
C. 9.5 g.
D. 10 g.

B3.

119

Which beaker of water and spatula of salt would make the most dilute solution when mixed?



D2.

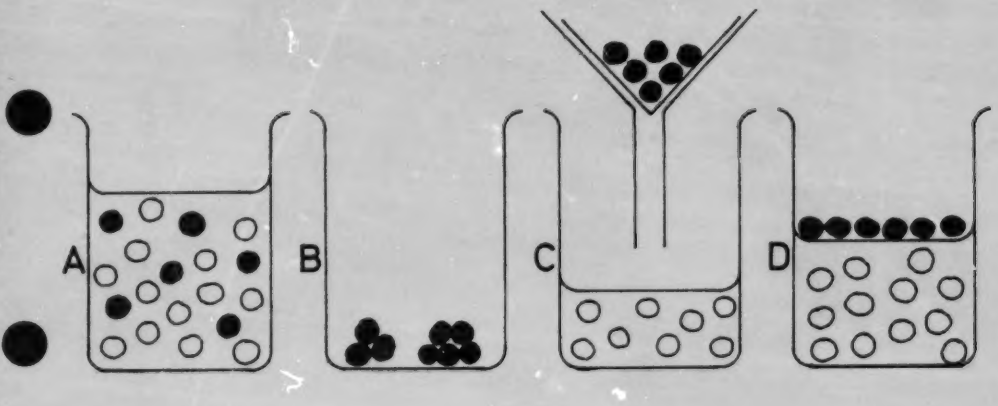
120

A student was provided with four different liquids and one solid. He was asked to find out which of the liquids would dissolve the solid fastest. Which of the following things should he NOT DO when trying to find out?

A. Use the same amount of each liquid when testing.
B. Keep all the liquids at the same temperature during his tests.
C. Stir only those liquids that need stirring to dissolve the solid.
C3 D. Use the same amount of solid in each of his tests. 121

A solution of copper sulfate was allowed to crystallize. If water particles and copper sulfate particles are represented as

○ = water
● = copper sulfate



B3 Which diagram represents the contents of the beaker after the crystallization has occurred? 122

An aqueous solution of sodium chloride is evaporated to half its original volume. The concentration of sodium chloride has

A. doubled.
B. halved.
C. remained the same.
A1 D. decreased by an unknown amount. 123

A student needed to dissolve some large crystals of sugar in water. Which of the following would not make the crystals dissolve faster?

A. Crushing the crystals before adding them to the water.
B. Heating the water before adding the crystals.
C. Adding the crystals one at a time.
C4 D. Stirring the crystals in the water. 124

On adding a solute to a solvent there comes a point where no more solute will dissolve. If the solvent is then allowed to evaporate, the solution contains more solute than it can hold permanently. The solution is said to be

A. concentrated.
B. partially saturated.
C. saturated.
D1 D. supersaturated. 125

The components of a solution CANNOT be separated by

A. crystallization. C. evaporation.
D1 B. distillation. D. filtration. 126

Ten students each mixed 50 mL of water and 50 mL of methylated spirits. They then measured the volume of the mixture. One student got 96.3 mL, two got 96.4 mL, four got 96.5 mL, two got 96.6 mL, and one got 96.7. A scientist would explain these results by saying that

A. there would have been a drop in temperature, so that the liquid contracted.
B. there would have been a rise in temperature, and some of the liquid would have evaporated.
C. the particles of the two liquids would have fitted in between each other.
C1 D. the students must have all been wrong in their measurements. 127

Which of the following could NOT be called a solution? A mixture of

A. salt and water. C. oxygen and nitrogen.
D3 B. alcohol and water. D. smoke and air. 128

Under which conditions is a gas most soluble in a liquid?

A. Low temperature and low pressure.
B. Low temperature and high pressure.
C. High temperature and low pressure.
B1 D. High temperature and high pressure. 129

When the lid is taken off a bottle of lemonade, bubbles appear throughout the drink for the same reason that

A. deep sea divers get the "bends".
B. magnesium bubbles when acid is added.
C. water bubbles when heated.
A1 D. bubbles rise from soil when water is added. 130

Which two substances when mixed will form a solution?

A. Kerosene and water.
B. Water and petrol.
C. Petrol and mineral turpentine ("turps").
C1 D. Mineral turpentine and water. 131

The air is a saturated solution of water vapour when the

A. humidity is 100%, regardless of temperature.
B. temperature is high, regardless of humidity.
C. temperature is low and humidity is high.
A1 D. temperature is high and humidity is high. 132

The next question refers to the table below which shows the results of an experiment. Four test tubes, containing equal amounts of liquid were set up as the table shows, and the times taken for the crystals to dissolve were recorded.

1	2	3	4
coarse crystals	fine crystals	fine crystals	fine crystals
tube shaken	tube shaken	tube allowed to stand	tube shaken and heated
2 minutes	30 seconds	2 hours	10 seconds

Using the information presented decide which one of the following four statements most surely reflects the results.

A. Coarse crystals dissolve quickly because of a large surface area.
B. Finely ground crystals will dissolve quickest if the tube is shaken and heated.
C. Shaking a tube makes little difference to the rate at which crystals dissolve.
B4 D. Fine crystals dissolve slowly because of their reduced surface area. 133

When copper sulfate is added to water it dissolves to form a blue solution. This solution is best described as a(n)

A. compound. C. mixture.
C3 B. element. D. suspension. 134

Which conditions correctly describe the forces involved when substance X will dissolve in liquid Y?

	Forces between X-X particles	Forces between Y-Y particles	Forces between X-Y particles
A.	weak	weak	weak
B.	strong	weak	strong
C.	strong	strong	weak
D2 D.	weak	weak	strong

135

When a small amount of water is dissolved in methylated spirits then the

A. water is the solvent and the spirits the solute.
B. water is the solute and the spirits the solvent.
C. water and the spirits are both called solutes.
B2 D. water and the spirits are both solvents. 136

A solution is NOT formed by dissolving

A. one liquid in another liquid.
B. a gas in a liquid.
C. a gas in another gas.
D2 D. a solid in another solid. 137

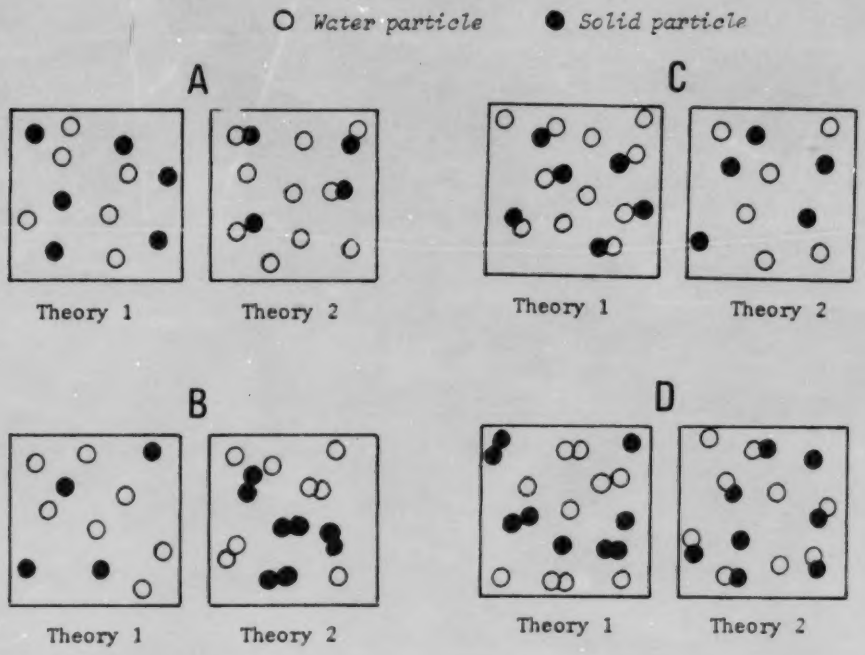
Two theories as to why solids dissolve in a liquid, have been suggested by scientists.

They are:

Theory 1: The solid particles fit between the water particles.

Theory 2: The solid particles join onto the water particles.

Which pair of diagrams below correctly fits *both* of these theories?



A3.

138

A student tested six compounds containing the element sodium and found that they all dissolved readily in water. He should conclude that

A. common sodium compounds dissolve in water.
B. sodium compounds dissolve in water.
C. some sodium compounds dissolve in water.
D. water is able to dissolve most compounds.

C2.

139

Observe the diagrams of the following four test tubes which show an experiment used to determine the time taken for equal quantities of crystals to dissolve.

coarse crystals	fine crystals	fine crystals	fine crystals
tube shaken	tube shaken	tube allowed to stand	tube shaken and heated
2 minutes	30 seconds	2 hours	10 seconds

Using the information presented decide which one of the following four statements most surely reflects the results.

A. Coarse crystals dissolve quickly because of a large surface area.
B. Finely ground crystals will dissolve quickest if the tube is shaken and heated.
C. Shaking a tube makes little difference to the rate at which crystals dissolve.
D. Fine crystals dissolve slowly because of their reduced surface area.

ACIDS-BASES NEUTRALISATION

When vinegar is mixed with sodium bicarbonate there is a vigorous reaction in which the gas carbon dioxide is released. This reaction would best be described as

A. hydrolysis.
B. neutralisation.
C. precipitation.
D. saponification.

B2

141

If you splashed some acid or some base on your face, the first thing you would do is

A. pour vinegar onto your face.
B. rub sodium bicarbonate into the splash.
C. wash your face with both vinegar and sodium bicarbonate.
D. wash your face with water.

D4

142

A bee sting is an injection of formic acid. One method of reducing the pain is to smear the area with "blue bag". The blue bag most probably contains

A. an acid.
B. a base.
C. salts.
D. vinegar.

B4

143

Some acid was added to each of the four substances:

I. Calcium carbonate.
II. Marble chips.
III. The mineral calcite.
IV. Crushed shell fragments.

All FOUR reacted quickly and produced carbon dioxide gas.
This indicates that all FOUR substances must contain

A. carbon.
B. calcium.
C. chlorine.
D. hydrogen.

A2.

144

All school students are taught to dilute strong acid this way: "Always add acid to water, never add water to acid." This rule is taught because if you added water to the acid,

A. there could be a dangerous reaction.
B. the acid and the water would form two distinct layers.
C. the water would only sink slowly.
D. the molecules of the acid would not be able to move.

A3

145

The correct way to dilute concentrated sulfuric acid with water is to

A. add water to the acid slowly while stirring.
B. add the acid to water slowly while stirring.
C. pour the acid and water from two containers at the same time into a third container.
D. add ice water to the acid slowly while stirring.

B2

146

Most acids when poured onto carbonate compounds produce bubbles of carbon dioxide gas

When hydrochloric acid is poured onto a rock, bubbles of gas are seen. From this observation you can conclude that the rock

A. contains calcium carbonate.
B. has pockets of gas in it.
C. is an alkali.
D. turns litmus red.

A3. 147

Acids are regarded as compounds because they

A. contain at least two elements.
B. contain hydrogen.
C. dissolve in water.
D. turn blue litmus paper red.

A3. 148

A solution containing only potassium nitrate and water can be made by adding together solutions of

A. potassium hydroxide and nitric acid.
B. potassium sulfate and nitric acid.
C. potassium carbonate and sodium sulfate.
D. potassium chloride and nitric acid.

A.3 149

A powder that is mixed with water to make fizzy drinks contains potassium bicarbonate $KHCO_3$ and citric acid $C_6H_8O_7$. The gas which bubbles out when you mix the powder with water is most likely to be

A. hydrogen sulfide H_2S
B. hydrogen chloride HCl
C. nitrogen dioxide NO_2
D. carbon dioxide CO_2

D4. 150

All acids contain the element

A. oxygen.
B. hydrogen.
C. nitrogen.
D. sulfur.

B.2 151

All acids which dissolve in water react with

A. metals to form water.
B. alcohols to form carbon dioxide.
C. carbonates to form carbon.
D. bases to form water.

D3

152

Some copper oxide is added to some sulfuric acid and boiled. The resulting solution was clear blue. This would suggest that the resulting solution must contain

A. copper oxide and water.
B. copper oxide and sulfuric acid.
C. copper sulfate and sulfuric acid.
D2 D. copper sulfate and water. 153

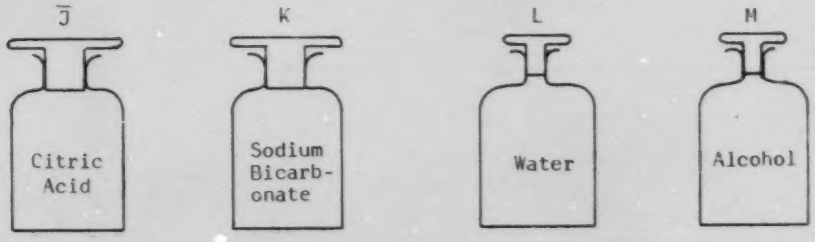
Three elements which will react with concentrated hydrochloric acid are

A. calcium, magnesium, copper.
B. tin, zinc, iron.
C. lead, carbon, silver.
B1 D. potassium, silicon, gold. 154

Getting soap in your eyes is a painful experience. This is the result of the reaction of soap with water to produce

A. an acid solution.
B. a solution of pH about 7.
C. a basic solution.
C1 D. sharp particles of a solid. 155

Pictured below are two bottles of solids (J - Citric Acid and K - Sodium bicarbonate) and two bottles of liquids (L - water and M - alcohol).



To make an effervescent mixture (producing gas bubbles) you would need to mix

A. J and K.
C1 B. K and L.
C. J, K and L.
D. J, K and M. 156

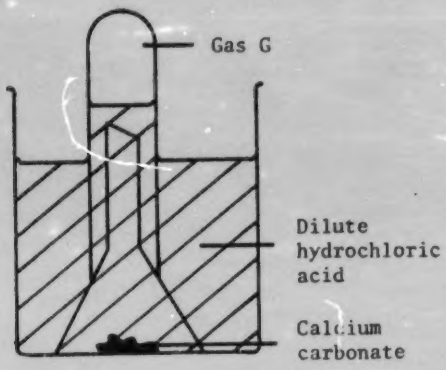
Which of the following reactions could produce hydrogen gas?

A. Hydrochloric acid and magnesium.
B. Acetic acid and sodium hydroxide.
C. Sulfuric acid and limestone.
A3 D. Nitric acid and calcium oxide. 157

Which *element* is formed when zinc and hydrochloric acid react with one another?

A. Chlorine.
B1 B. Hydrogen.
C. Water.
D. Zinc chloride. 158

The next question refers to the following diagram.



Consider the above diagram. The gas, G, would

A. turn limewater cloudy.
B. turn red litmus blue.
C. "pop" when ignited.
A2 D. relight a glowing splint. 159

The gas liberated when dilute sulfuric acid reacts with potassium carbonate is also liberated in many other chemical reactions. In which of the following reactions is this gas NOT liberated?

A. Hydrochloric acid on marble.
B. Photosynthesis.
C. Respiration.
B1 D. Burning a hydrocarbon. 160

When an acid is added to a carbonate (such as calcium carbonate) a gas is produced.

Acid + carbonate → salt + water + gas

That gas is most probably

A. carbon dioxide. C. nitrogen.
A3 B. hydrogen. D. oxygen. 161

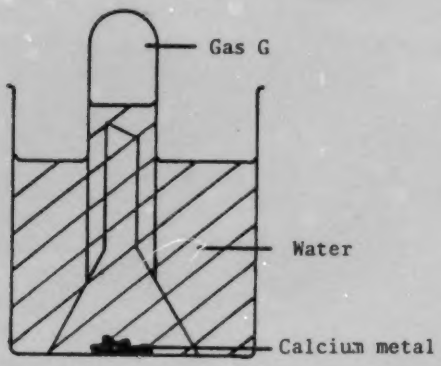
An acid-bicarbonate (red can) extinguisher should not be used to put out an electrical fire because <u>carbon dioxide</u>

A. ignites easily at high temperatures.
B. will react with dilute sulfuric acid.
C. forms a foam which conducts electricity.
D. foam cannot be played onto the fire with sufficient pressure. 162

Water is <u>not</u> formed when hydrochloric acid is added to

A. calcium carbonate. C. magnesium metal.
C3 B. copper oxide. D. sodium hydroxide. 163

The next question refers to the following diagram.



Consider the above diagram. The gas, G would

A. turn blue litmus red.
B. turn limewater cloudy.
C. relight a glowing splint.
D. "pop" when ignited.

164

Four colourless solutions A-D, were tested with litmus, silver nitrate solution and sodium carbonate solution. The results of these tests are set out in the following table.

Solution	Reaction with litmus	Reaction with silver nitrate	Reaction with sodium carbonate
A.	no observable change	white precipitate	no observable reaction
B.	blue turned red	white precipitate	carbon dioxide evolved
C.	blue turned red	no precipitate	carbon dioxide evolved
D.	red turned blue	brown precipitate	no observable reaction

Given that one solution is hydrochloric acid which one is it?

165

A "basic oxide" is so-called because it

A. reacts with an acid to form a salt and water.
B. is formed by reacting an oxide with a base.
C. reacts with water to form a hydroxide base.
D. is formed by burning a basic substance in air.

166

Which reaction below would produce an acid as one of the products?

A. Magnesium oxide + water.
B. Sodium hydroxide + water.
C. Sodium + water.
D. Sulfur dioxide + water.

167

Which reaction would be classified as a neutralisation reaction? The reaction between hydrochloric acid and

B1
A. sodium carbonate.
B. sodium hydroxide.
C. sodium metal.
D. copper oxide.
168

Which compound below would react with hydrochloric acid to form a salt and water as the only products?

B1
A. Calcium carbonate.
B. Magnesium oxide.
C. Sodium chloride.
D. Zinc sulfate.
169

Which of the substances listed below would neutralise the other three?

C1
A. Dilute nitric acid.
B. Lemon juice.
C. Dilute caustic soda.
D. Vinegar.
170

Cabbages do not grow well in acid soil. A farmer who had soil that was too acidic should treat the soil with

C3
A. an all-purpose fertiliser.
B. compost.
C. lime.
D. super-phosphate.
171

Most plants grow best when the pH of the soil is between 5.5 and 6.5. Many soils have a pH of 3 to 5 and these must be adjusted by the addition of

A1
A. lime.
B. sulfur.
C. rotted compost.
D. sulfate of ammonia.
172

Fizz powders such as fruit saline are a mixture of sodium bicarbonate and

B4
A. acetic acid.
B. citric acid.
C. hydrochloric acid.
D. sulfuric acid.
173

When an acid is mixed with a base the process is called

D5
A. condensation.
B. distillation.
C. evaporation.
D. neutralisation.
174

Some acid is mixed with some base so that neither blue litmus nor red litmus will change colour. The beaker would therefore contain

A. acid and base.
B. acid and water.
C. base and water.
D. salt and water.
175

B3
Indigestion is frequently treated by taking a tablet containing sodium bicarbonate. The chemical reaction which occurs is

A. hydrolysis.
B. neutralisation.
C. saponification.
D. synthesis.
176

INDICATORS
pH

The next two questions refer to this information.

A student added two drops of universal indicator to each of four beakers containing colourless solutions.
The results are shown below.

SOLUTION	TURNS
1	Green
2	Blue
3	Red
4	Yellow

Which solution(s) could be acidic?

A. 1 and 2.
B. 3 and 4.
C. 3 only.
D. 1, 2 and 4.

B2. 177

Which solution would be the most acidic?

A. 1 B. 2 C. 3 D. 4

C3. 178

The chemical cobalt nitrate is painted on some weather indicators used in household barometers.

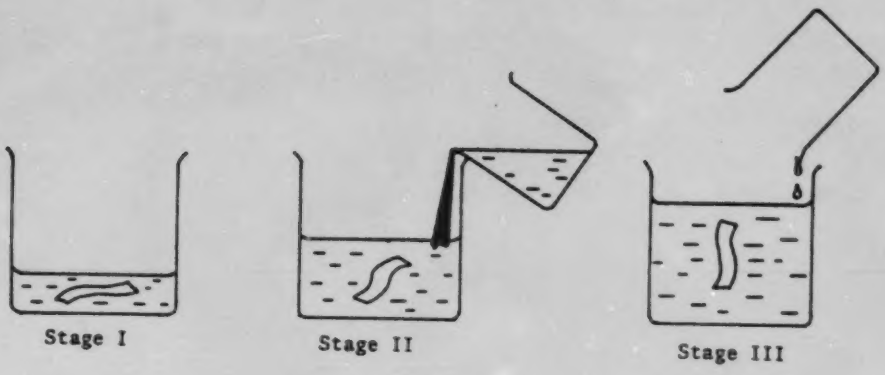
When the weather is fine the chemical is blue, when the rain is likely, the chemical turns pink.

This change of colour is most likely to be caused by

A. the temperature of the air.
B. air pressure near the barometer.
C. humidity of the air.
D. ionisation caused by lightning.

C4. 179

The next question refers to the diagrams below.



1. The diagrams show three stages in adding solution Y to solution X. A student adds a piece of RED litmus paper to solution X at stage I and notes the results:

Stage I	Stage II	Stage III
RED	RED	BLUE

If the student were to repeat the experiment but adding a piece of BLUE litmus paper at stage I, the correct sequence of colour changes would be

	STAGE I	STAGE II	STAGE III
A	BLUE	BLUE	RED
B	BLUE	RED	RED
C	RED	BLUE	BLUE
D	RED	RED	BLUE

180

A gardener has discovered that the soil in his garden is acidic (pH of 3.5) and he wishes to grow vegetables which tolerate only neutral conditions (pH of about 7). To enable the vegetables to grow successfully he would be wise to

A. add an acidic fertiliser to the soil.
B. add a strong base such as caustic soda to the soil.
C. burn the acid out of the soil.
D. add a neutralising agent such as limestone to the soil.

The pH of blood is normally about 7.4. After exercise which produces more carbon dioxide, the pH changes to about

A. 7.1 as the CO_2 reacts with water in the blood to form a slightly more acidic solution.
B. 7.1 as the CO_2 reacts with water in the blood to form a slightly more alkaline solution.
C. 7.7 as the CO_2 reacts with water in the blood to form a slightly more acidic solution.
D. 7.7 as the CO_2 reacts with water in the blood to form a slightly more alkaline solution.

A1 182

A student added a few drops of methyl orange solution to each solutions as shown in the table below.

A	B	C	D
water	sodium hydroxide	glucose	vinegar

Which solution would change the colour of methyl orange from red to yellow?

B1 183

A student added a few drops of Universal Indicator to each of the four solutions. The colours of the four mixtures were:

A	B	C	D
turns green	turns blue	turns red	turns yellow

Which solution would react <u>MOST VIOLENTLY</u> with sodium carbonate powder?

C2 184

In which solution would Universal Indicator be most red in colour?

A. Ammonia.
B. Salty water.
C. Soapy water.
D. Vinegar.

D3 185

Which substance will cause moist red litmus to change colour?

A. Ammonia.
B. Carbon dioxide.
C. Hydrogen.
D. Sulfur dioxide.

A3 186

The next 3 questions refer to this information

Four solutions were tested with different indicators as shown below:-

Solution	Indicator used to test solution	Observation
P	Methyl Orange	Solution turns yellow
Q	Red Litmus	Litmus stays red
R	Blue Litmus	Litmus stays blue
S	Universal Indicator	Solution turns green

Which solution COULD be water?

A. P only
B. Q or R only
C. Q or R or S
D. S only

C1. 187

Which solution has reacted with the indicator used in such a way that it, rather than any of the other solutions, is most likely to be water?

A. P C. R
B. Q D. S

D2. 188

Why are we unable to say definitely which solution, if any, is water?

A. Two indicators, say red & blue litmus, need to be used to find out which is water.
B. A neutral reaction with an indicator is caused by many solutions, not only water.
C. None of the tests used has been controlled - a container of water should have been tested also.
D. Indicators will only react with solutions which are either acidic or alkaline.

B2. 189

The next four questions refer to the following information

A student tested four solutions with Universal Indicator and obtained the following results:

Solution	Colour on Adding Universal Indicator
P	Green
Q	Blue
R	Red
S	Yellow

Which solution is most likely to be water?

A1 A. P B. Q C. R D. S 190

Which solution is most likely to be lemon juice?

A. P B. Q C. R D. S 191

Which solution would react most vigorously with sodium carbonate?

C1 A. P B. Q C. R D. S 192

Which two solutions would react with one another to form a salt and water?

A. P and Q. C. Q and R.
C1 B. P and S. D. R and S. 193

The reaction between an acid solution and a base solution would best be represented by

A. acid + base → reaction.
B. acid + base → salt + hydrogen.
C acid + base → water.
D3 D. acid + base → salt + water. 194

Some yellow face-tissues turn blue when they are placed in acid. This is probably due to

A. a chemical reaction with the acid.
B. the effects of chromatography.
C. the yellow dye being dissolved by the acid.
D. the yellow dye acting as an indicator. 195

Some chemicals change colour depending on the amount of moisture around them.
This is used in

A. weather indicators. C. neutralisation reactions.
B. colouring for jellys. D. fluorescent paints. 196
A2.

The pH of human blood is approximately 7.4. This is

D1
A. strongly acidic.
B. strongly alkaline.
C. weakly acidic.
D. weakly alkaline.
197

The next two questions refer to the following information.

An indicator has this range of colours:

COLOUR	Red	Orange	Yellow	Green	Blue	Indigo	Violet
pH VALUE	4	5	6	7	8	9	10

From this information, which of the following would make the indicator turn blue?

D1
A. A strong acid.
B. A weak acid.
C. A strong base.
D. A weak base.
198

Which of the following would make the indicator turn yellow?

A1
A. Dilute vinegar.
B. Strong ammonia.
C. Dilute ammonia.
D. Concentrated sulfuric acid.
199

Which of the following substances would give an acid reaction with wet litmus paper?

D1
A. Aluminium oxide.
B. Calcium oxide.
C. Hydrogen oxide.
D. Sulfur dioxide.
200

A piece of red and a piece of blue litmus paper were placed in each of the following solutions. In which solution would both pieces be blue?

D1
A. Apple juice.
B. Lemonade.
C. Rain water.
D. Soapy water.
201

A student used phenolphthalein as an indicator in an acidic solution. While slowly adding an alkali to this solution a colour change was observed. What would the colour change have been?

B2
A. Blue to red.
B. Colourless to pink.
C. Pink to yellow.
D. Red to yellow.
202

A piece of red litmus paper is placed in an unknown solution and stays red. From this information we can say that the solution is

D1
A. acidic.
B. basic.
C. neutral.
D. either acid or neutral.
203

METALS ACTIVITY SERIES

Three elements which will react with concentrated hydrochloric acid are

A. calcium, magnesium, copper.
B. lead, carbon, silver.
C. potassium, silicon, gold.
D. tin, zinc, iron.

D 204

With which metal will dilute sulfuric acid react to form hydrogen gas as one of the products?

A. Copper.
B. Gold.
C. Silver.
D. Tin.

D1 205

Many metals are used as thin coatings over steel to prevent corrosion of the steel. Tinned steel is used for food and drink containers yet tin accelerates the corrosion of steel. The purpose of using tin instead of any other metal is to

A. prevent food contamination.
B. restrict the length of life of the food container.
C. reduce the corrosion of the steel.
D. give the steel can additional strength.

A4 206

Copper was one of the earliest metals known to man because

A. it was harder than flint for tools.
B. it was a better conductor of heat.
C. the earth's crust contains a higher percentage of copper.
D. it is easily extracted from its ore.

D3 207

Which list contains metals which are most often found free in nature?

A. Aluminium, copper, gold.
B. Copper, iron, mercury.
C. Gold, iron, silver.
D. Gold, mercury, silver.

D3 208

When an active metal (such as magnesium) dissolves in an acid a gas is formed.

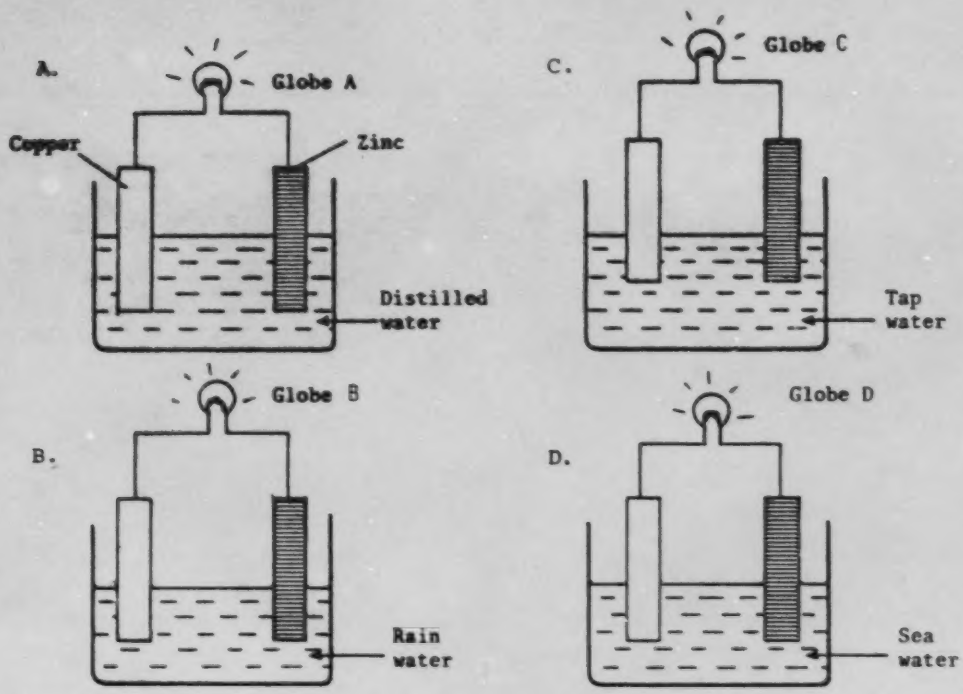
Active metal + acid → salt + gas

The gas is most probably

A. carbon dioxide.
B. hydrogen.
C. nitrogen.
D. oxygen.

209

The next question refers to these diagrams.



D3 If each container contains a copper and a zinc electrode, which globe would glow most brightly?

210

B4 The metal which reacts with water to form a solution which will turn red litmus blue is

A. aluminium.
B. calcium.
C. iron.
D. lead.

211

A1 In which reaction will hydrogen gas NOT be produced?

A. Concentrated sulfuric acid on iron.
B. Concentrated hydrochloric acid on zinc.
C. Dilute hydrochloric acid on magnesium.
D. Dilute sulfuric acid on tin.

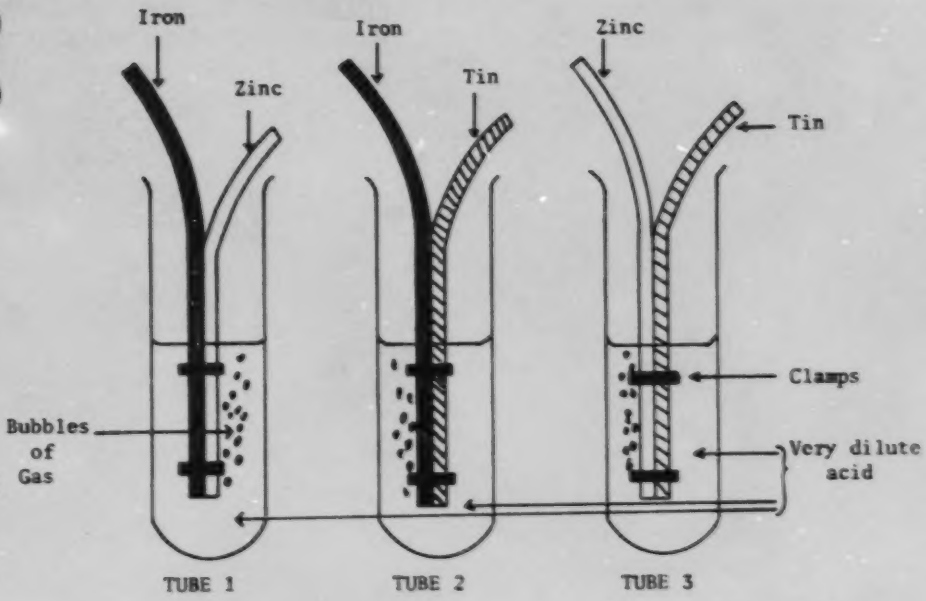
212

When we look at the reaction rates of water with iron, magnesium, barium and potassium (in that order) we find that the reaction rate

A. increases.
B. decreases.
C. increases then decreases.
D. decreases then increases.

213

This question refers to this experiment.



Observations Made:

Tube 1 : Zinc reacted with acid
Tube 2 : Iron reacted with acid
Tube 3 : Zinc reacted with acid

On the basis of this experiment what is the order of activity of the metals from most to least active?

A. Iron, Zinc, Tin.
B. Zinc, Iron, Tin.
C. Tin, Iron, Zinc.
D. Iron, Tin, Zinc.

B3. 214

A student was given three flat pieces of metal labelled X,Y,Z. He was told that the metals would be either tin, magnesium or zinc and asked to carry out a test to see if he could identify them.

He made the following observations.

I. All the metals formed bubbles when placed in dilute hydrochloric acid.
II. The bubbles formed very quickly on the surfaces of X and Z.
III. The bubbles formed very slowly on the surface of Y.

As a result of his test the student could say that

A. metal X is zinc.
B. metal Y is magnesium.
C. metal Y is tin.
D. metal Z is magnesium.

C3 C3 215

The following information refers to the next 10 questions.

The following list is an "Activity Series of Metals" for some of the elements found on the planet *Xenos*. The list is compiled using the same theory as we use on Earth for the Activity Series we have been using.

Element	Atomic Symbol	Valency
Trokon	Tr	+1
Arkon	Ar	+1
Bolol	Bo	+1
Haston	Ha	+1
Sarkon	Sa	+2
Palon	Pa	+2
Frelon	Fr	+1
Grokon	Gr	+3
Kalon	Ka	+1
Drakon	Dr	+2
Workon	Wo	+4
Endon	En	+3
Piston	Pi	+2

The most active, and least active metals on this list from *Xenos*, respectively, are

A. Trokon and Arkon.
C. Trokon and Piston.
C3 B. Piston and Endon.
D. Piston and Trokon.

216

Which elements are both more active than Frelon?

A. Arkon and Sarkon.
C. Kalon and Drakon.
A2 B. Endon and Trokon.
D. Palon and Grokon.

217

If a piece of Kalon metal was placed in a solution of each of the following metal ions, in which would a reaction occur?

A. Bolol.
C. Kalon.
D1 B. Grokon.
D. Piston.

218

Which of the following metals would form the most stable compounds?

A. Arkon.
C. Haston.
A1 B. Bolol.
D. Drakon.

219

More questions appear on the next page.

The questions on this page refer to the information on the previous page.
A new metal Qualon has been discovered and experiments have shown that it will replace Frelon ions from solution.
However, when a piece of Palon is placed into a solution of Qualon ions, the Palon dissolves.
When placed into a solution of Qualon ions, Grokon remains unchanged.
Where, on the series, would Qualon best fit?

A. Higher than Palon.
B. Between Palon and Frelon.
C. Between Frelon and Grokon.
B2 D. Below Grokon.

220

Which metal, as an electro-plated coating, would best protect Palon from corrosion?

A. Endon.
A2 B. Frelon.
C. Kalon.
D. Sarkon.

221

Which equation shows a correct reaction for the metal concerned?

A. Tr + 1 electron → Tr^{+}
B. Sa - 2 electrons → Sa^{2-}
C. Dr + 2 electrons → Dr^{-}
D2 D. En - 3 electrons → En^{3+}

222

The correct order of metal ions from most active to least active, is

A. Wo^{4+}, Gr^{3+}, Pi^{2+}
B. Gr^{3+}, Wo^{4+}, Pi^{2+}
C. Pi^{2+}, Wo^{4+}, Gr^{3+}
D. Gr^{3+}, Pi^{2+}, Wo^{4+}

223

Which metal would be most likely to be inert to dilute hydrochloric acid, and to dilute sulfuric acid?

A. Haston.
D2 B. Grokon.
C. Kalon.
D. Workon.

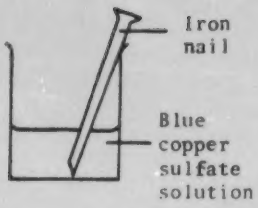
224

If the first metal mentioned in each choice was placed into a solution containing ions of the second metal, in which case would the reaction proceed at the quickest rate?

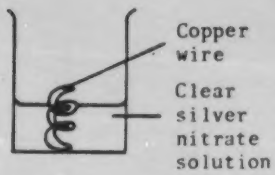
Choice	Metal	Metal Ion Solution
A	Haston	Grokon
B	Trokon	Haston
C	Frelan	Piston
C1 D	Palon	Trokon

225

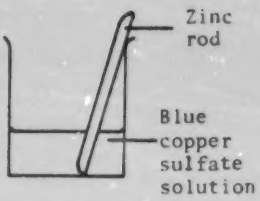
The next 2 questions refer to the following evidence.



Copper coating forms on nail : solution turns green



Silver coating forms on wire : solution turns blue



Copper coating forms on rod : solution turns clear

A group of students have drawn up tables of activity of metals, going from the most active to the least active. Which of the following answers is nearest to correct?

A. Silver : Copper : Zinc : Iron.
B. Iron : Copper : Silver : Zinc.
C. Iron : Zinc : Copper : Silver.
D. Iron : Copper : Zinc : Silver.

C.1 226

The students decided to do another experiment in order to work out the whole list correctly. Which of the following experiments would allow the students to do this?

A. Silver wire in copper sulfate solution.
B. Zinc rod in iron (II) sulfate solution.
C. Copper wire in zinc sulfate solution.
D. Copper wire in iron (II) sulfate solution.

B.1 227

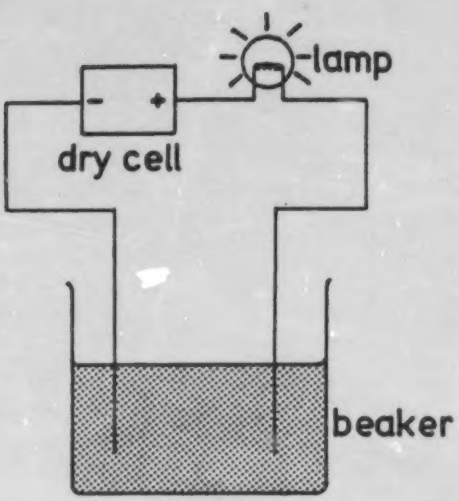
If a metal is described as ductile it means that the metal

A. is hard.
B. has a high density.
C. can be rolled into thin sheets.
D. can be drawn out into wires.

D.1 228

ELECTROCHEMISTRY

The next question refers to this diagram.



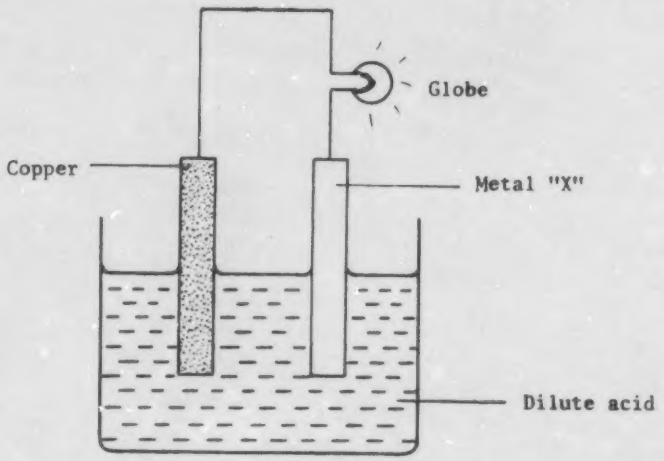
Because the lamp is glowing the liquid in the beaker is most probably

A. pure water.
B. kerosene.
C. sugar solution.
D. acid solution.

D.3

229

The next question refers to this diagram.



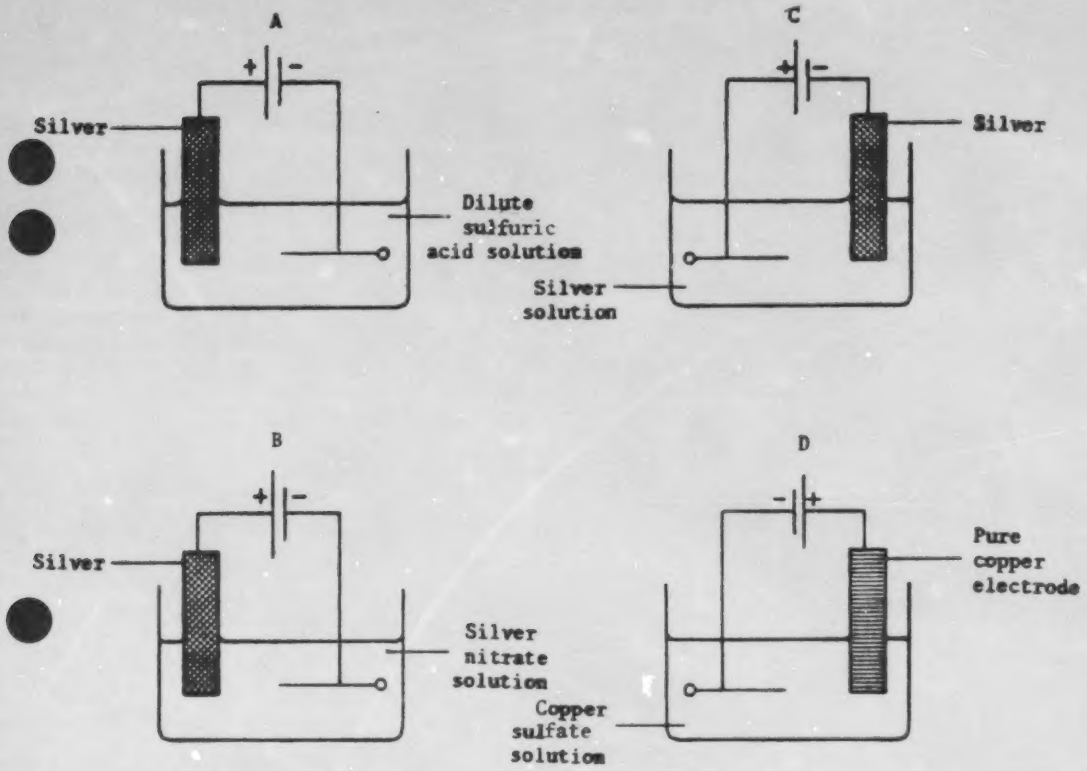
Which metal (below) when placed in the circuit instead of metal "X", would cause the globe to glow most brightly?

C2

A. Tin.
B. Silver.
C. Zinc.
D. Lead.

230

The next question refers to these diagrams.

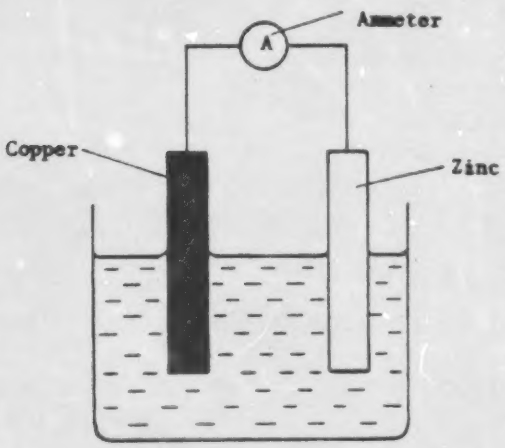


Which circuit above best resembles the circuit used in industry to make silver plated cutlery sets?

B2.

231

The next question refers to this diagram



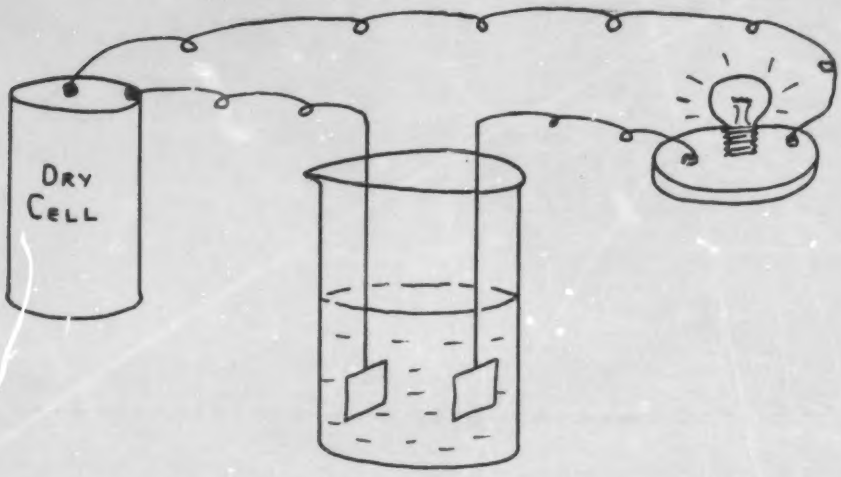
Which solution would cause the largest current to flow in the circuit drawn above?

A. sugar disolved in water
B. methylated spirits
C. vinegar.
D. olive oil.

C1.

232

The next three questions refer to this diagram.



The diagram above shows a dry cell connected to a lamp through two metal plates immersed in water containing a dissolved substance.

The shining lamp means that the solution must contain

A. atoms. B. ions. C. molecules. D. neutrons.

B2.

233

The shining lamp means that the substance is

A. a carbohydrate.
B. an electrolyte.
C. a non-electrolyte.
D. an insoluble substance.

B5.

234

The shining lamp means that the substance <u>cannot</u> be

A. an acid. B. an alkali. C. a salt. D. a sugar.

D3.

235

The next question refers to the following information.

Three compounds X, Y and Z have the following properties:

Compound X - conducts electricity in liquid form, but not in solid form.
Compound Y - conducts electricity in aqueous solution but not in solid form.
Compound Z - does not conduct in liquid, solid or aqueous solution.

Considering this information only, which compounds contain ionic bonds in their solid form?

A3
A. X and Y only.
B. Y and Z only.
C. X and Z only.
D. X, Y and Z.

236

Which of the following substances when dissolved in water would be a good electrolyte?

B4
A. Alcohol.
B. Common salt.
C. Glucose.
D. Soluble protein.

237

To electroplate a silver coin with copper, the electrolytic cell would contain a

D1

	Cathode of	Anode of	Solution of
A.	Copper	Silver	copper sulfate
B.	Silver	Copper	Silver nitrate
C.	Copper	Silver	silver nitrate
D.	Silver	Copper	copper sulfate

238

Which of the following particles move through an electrolyte to form an electrical current?

[illegible]1
A. Atoms.
B. Electrons.
C. Ions.
D. Protons.

239

Which element is formed in the greater volume during the electrolysis of water?

A3
A. Hydrogen.
B. Nitrogen.
C. Oxygen.
D. Sodium chloride.

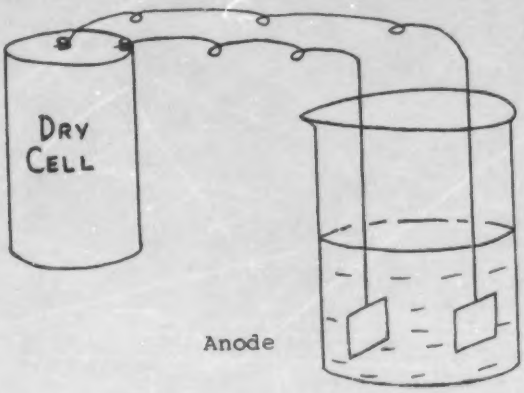
240

An electric current requires charged particles to be present for conduction - this occurs with ionic substances. Molecular substances will not conduct an electic current. Which of the following substances will not conduct an electric current?

[illegible]3
A. Pure water containing sulfuric acid.
B. Salt water.
C. Melted sodium chloride.
D. Melted paraffin.

241

The next question refers to the following diagram.



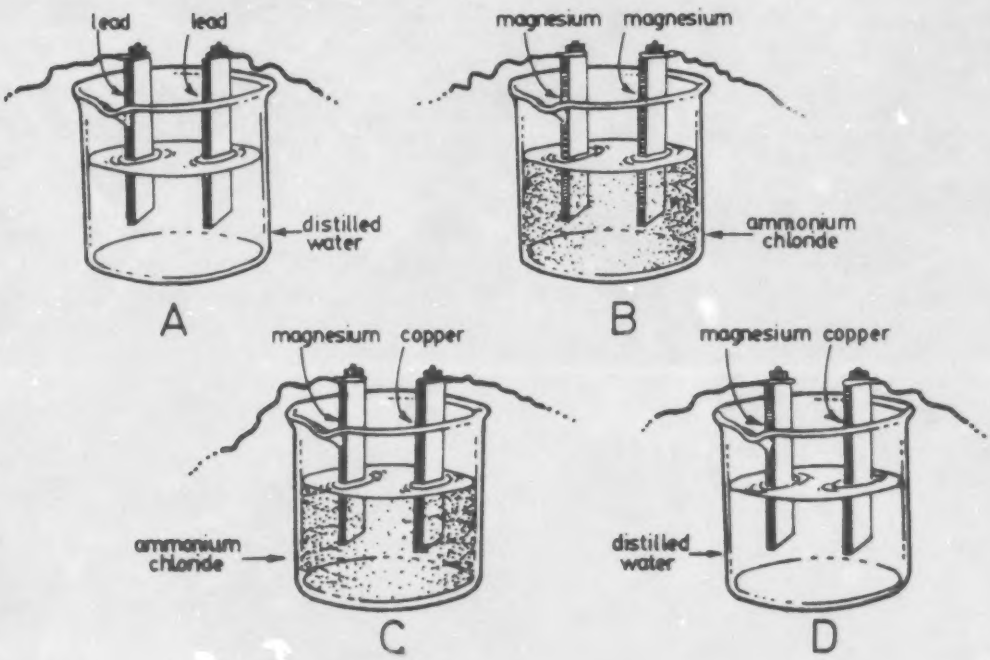
When a copper sulfate solution has an electric current passed through it, chemical changes occur at the electrodes. Which of the following reactions can be observed during the electrolysis?

A. Copper ions are given off at the negative electrode (cathode).
B. Hydrogen gas is produced at the positive electrode (anode).
C. Oxygen gas is produced at the positive electrode (anode).
D. Copper metal is deposited at the negative electrode (cathode).

D2

242

Which of the arrangements would be most likely to produce an electric current, if connected into a circuit?



C2

243

22. Chemicals A & B are each soluble in water and are made up of charged particles called ions. The ions in chemicals A & B can be represented as shown.

When the two chemicals are mixed together a dense precipitate forms. Which of the following combinations of ions could represent the precipitate;

A. ⊕⊞ C. ⊖⊟

B. ⊖⊕ D. ⊖⊞

D3.

244

The formula of a compound indicates the number of atoms of each type in a molecule of that compound. The formula for glucose is $C_6H_{12}O_6$. From this formula you can determine that

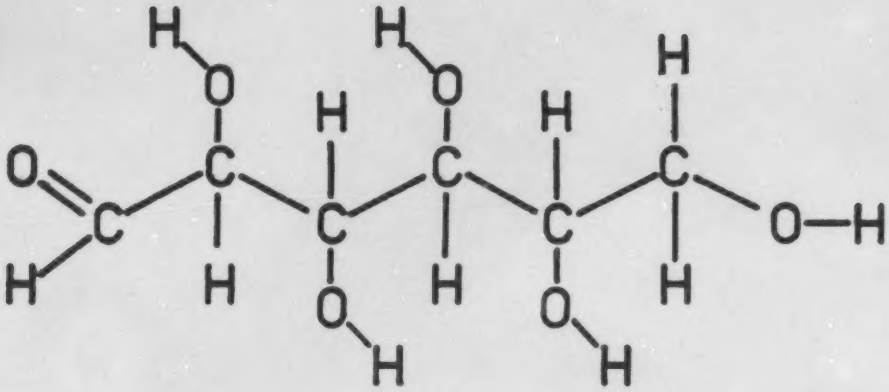
A. a molecule of glucose is made up of 24 atoms.
B. six atoms of carbon will always combine with twelve atoms of hydrogen.
C. glucose is made from carbon dioxide and water in green plants.
D. glucose often occurs in lollies.

A3.

245

FORMULAE EQUATIONS

A molecule of glucose can be represented like this:



Each O, C, H represents one atom of oxygen, carbon and hydrogen respectively. The number of atoms of each element in one molecule of glucose is

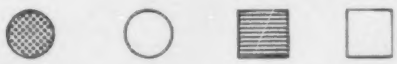
A. one oxygen, one hydrogen and one carbon.
B. five oxygen, seven hydrogen and six carbon.
C. six oxygen, twelve hydrogen and six carbon.
D. six oxygen, six hydrogen and six carbon.

C.4

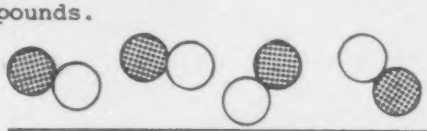
246

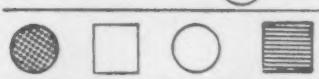
Elements compounds and mixtures are made up of very tiny particles called atoms.

The following symbols can represent different atoms.



Which of the sketches below represents molecules of compounds.

A.


B.


C.

D.

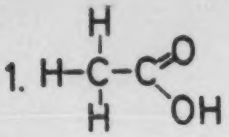
A3.

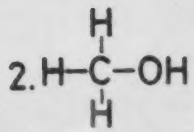
247

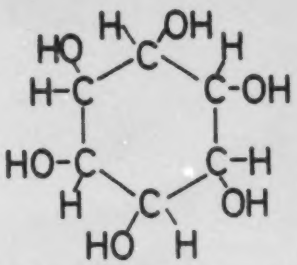
The next three questions refer to this information.

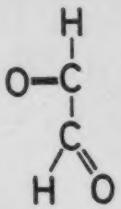
One characteristic of a sugar is that it contains hydrogen and oxygen atoms in the ratio 2:1, the same ratio as in water.

Which compound(s) could be sugars?

1.


2.


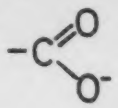
3.


4.


B3
A. 1 only.
B. 1 and 3.
C. 3 and 4.
D. 2, 3 and 4.

248

Another group of organic compounds, acids, on losing the acidic hydrogen, forms an ion which is characterised by the atoms:



Which compound(s) could be acids?

A3
A. 1 only.
B. 1 and 3.
C. 2 and 4.
D. 4 only.

249

With this additional information, which compound is most likely to be a sugar?

C2 A. 1 B. 2 C. 3 D. 4

250

Organic compounds must contain the element

A. hydrogen. B. oxygen. C. carbon. D. nitrogen.

C1.

251

Sugar contains three elements - carbon, hydrogen and oxygen. In sugars, the number of hydrogen atoms is always twice the number of oxygen atoms.
If table sugar, sucrose, contains 12 carbon atoms and 22 hydrogen atoms, how many oxygen atoms does it have?

A. 10 B. 11 C. 22 D. 34

B4.

252

An element with three electrons in its valence or outside energy shell could have binding powers (valencies) of

B2 A. 2 or 3 C. 3 or 7
B. 3 or 5 D. 4 or 5

253

If element X can have a valency of 1, 2 or 3 which formula is not possible?

C1 A. X_2O B. XO C. XO_2 D. X_2O_3

254

What is the valency of element X in the compound X_2O_5?

C3 A. 2 B. 3 C. 5 D. 7

255

The correct formula for sulfur trioxide is

B3 A. SO_2 B. SO_3 C. S_2O_3 D. S_3O_2

256

The correct formula for magnesium hydroxide is

D2 A. MgOH B. Mg_2OH C. Mg(OH) D. $Mg(OH)_2$

257

How many *atoms* join together to make one molecule of methyl ethyl ether $CH_3OC_2H_5$?

D1 A. 3 B. 5 C. 10 D. 12

258

Which formula below is *correct*?

D1 A. ZnCl B. Ca_2NO_3 C. KSO_4 D. Na_2CO_3

259

What is the *correct name* for the compound Na_2SO_4?

C4 A. Sodium sulfide. C. Sodium sulfate.
B. Sodium sulfite. D. Sodium thiosulfate.

260

If the formula for gallium chloride is $GaCl_3$, and the formula for sodium sulfide is Na_2S, then the formula for gallium sulfide is

B3 A. GaS_2 B. Ga_2S_3 C. GaS D. Ga_3S_2

261

Consider this partially completed chemical equation.

$$C_2H_5OH + CH_3COOH \rightarrow CH_3COOC_2H_5$$

This equation can be balanced by adding

A. H_2O to the left hand side.
B. H_2O to the right hand side.
C. $2H_2O$ to the left hand side.
B3 D. H_2 to the right hand side. 262

Consider the following incomplete chemical equation.

$$NH_3 + 2O_2 \rightarrow HNO_3$$

This equation can be balanced by adding to the right hand side

A. O_2 C. H_2O_2
B3 B. H_2O D. $2H_2O$ 263

Which two elements usually have the same valency?

A. Oxygen and chlorine. C. Copper and silver.
B3 B. Sodium and potassium. D. Nitrogen and carbon. 264

Which element usually forms an ion with valency +2?

A. Copper. C. Silver.
A2 B. Hydrogen. D. Sodium. 265

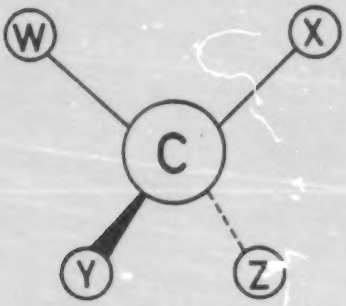
An element Y, forms Y^{2+} as its most common ion. Its electron distribution could be

A. 2 : 5 C. 2 : 8 : 4
D3 B. 2 : 6 D. 2 : 8 : 2 266

An element X, has an electronic configuration of 2 : 6. Which equation correctly represents the formation of the ions of X?

A. $X + e^- \rightarrow X^-$
B. $X + 2e^- \rightarrow X^{2-}$
C. $X \rightarrow X^{2+} + 2e^-$
B1 D. $X \rightarrow X^{4+} + 4e$ 267

Pictured below is a model of a carbon compound showing a single carbon atom bonded to four different atoms W, X, Y and Z.

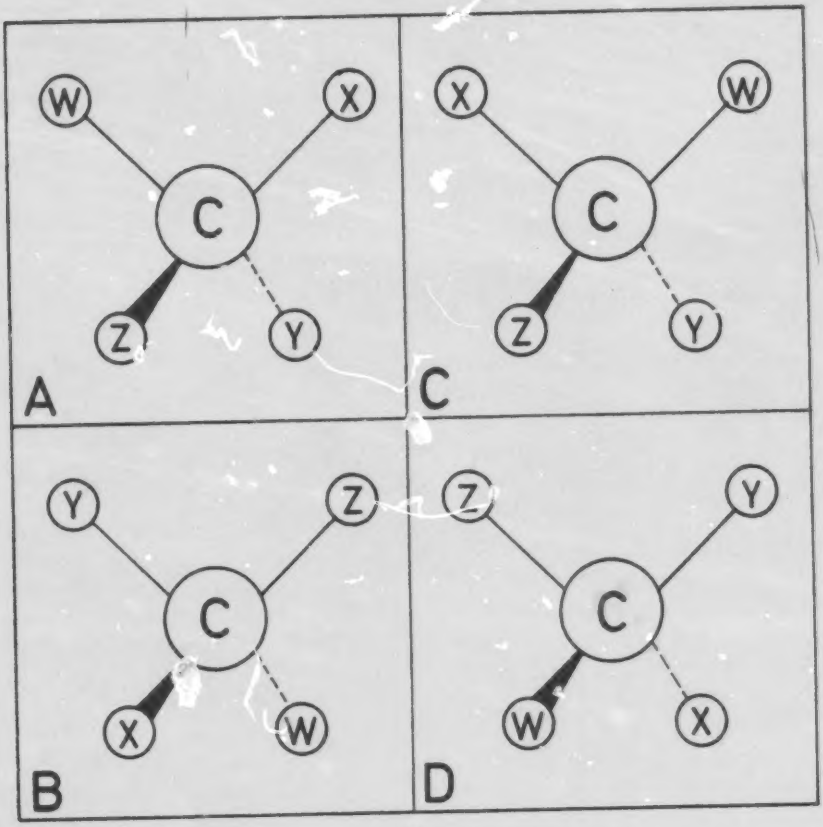


The bonds shown ——— are in the plane of the paper.

The bonds shown - - - - - are behind the plane of the paper.

The bonds shown ◀ are in front of the plane of the paper.

Of the four models shown below, the only one which is identical to the one shown above is



Which equation correctly represents the way magnesium forms ions?

A. $Mg + 2e^- \rightarrow Mg^{++}$

B. $Mg + 2e^- \rightarrow Mg^{2-}$

C. $Mg \rightarrow Mg^{2+} + 2e^-$

D. $Mg \rightarrow Mg^{+} + e^-$

269

Which element forms an ion by gaining electrons?

B3 A. Al B. Cl C. Mg D. Zn

270

Which statement is correct?

A. Metals form positive ions by gaining electrons, non-metals form negative ions by losing electrons.

B. Metals form positive ions by losing electrons, non-metals form negative ions by losing electrons.

C. Metals form positive ions by losing electrons, non-metals form negative ions by gaining electrons.

C3 D. Metals form negative ions by gaining electrons, non-metals form positive ions by losing electrons.

271

Which formula is the *correct* general formula for a salt in which the two combining elements M and X have the same valency?

A5 A. MX B. [illegible] C. MX_2 D. M_2X_3

272

How many oxygen atoms would be found in the oxide of a metal which had a valency of 4?

B2 A. 1 B. 2 C. 3 D. 4

273

The formula M_2O is the general formula for all metal oxides where the metal has a valency of

B2 A. 1 B. 2 C. 3 D. 4

274

Methane is a compound which contains only the elements carbon and hydrogen. If carbon has a valency of 4 in methane, then its formula is most probably

A. CH_2 B C_2H_4 C. CH_4 D. C_4H

275

The next five questions refer to the label below.

NEW! "NERVE RITE"
A NEW BRAIN SPRAIN CURE

CONTAINS

Mercuronerve	$HgNaH_2SO_6$
Hypothalamine	C_2AgONH_2
Bellemide	CaP_2NSO_3
Nervidine	$ClSH_3I_2$
Cerebrone	$CH_2Fe_2HAlCO_3$

From the label of the new Brain Sprain Cure "Nerve Rite" a student identified five chemical compounds. The name and formulae of the compounds are listed in the table below:

Name of compound in "Nerve Rite"	Formula
Mercuronerve	$HgNaH_2SO_6$
Hypothalamine	C_2AgONH_2
Bellemide	CaP_2NSO_3
Nervidine	$ClSH_3I_2$
Cerebrone	$CH_2Fe_2HAlCO_3$

The number of different elements in the compound Mercuronerve is

A3 A. 5 B. 7 C. 11 D. 13 276

The compound which contains silver is

A. Cerebrone.
B. Nervidine.
C. Mercuronerve.
D3 D. Hypothalamine. 277

The compounds which contain both carbon and oxygen are

A. Bellemide and Hypothalamine.
B. Mercuronerve and Bellemide.
C. Hypothalamine and Cerebrone.
C3 D. Cerebrone and Bellemide. 278

The compounds which both contain three or more [illegible]gen atoms are

A. Mercuronerve and Bellemide.
B. Cerebrone and Nervidine.
C. Mercuronerve and Hypothalamine.
B3 D. Cerebrone and Mercuronerve. 279

The compound which contains only non-metals is

A. Hypothalamine.
B. Bellemide.
C. Mercuronerve.
D2 D. Nervidine. 280

The element tellurium, Te, has the same valency in the two compounds, silver telluride, Ag_2Te, and antimony telluride Sb_4Te_6.

If the valency of silver Ag, in silver telluride is 1, then the valency of antimony, Sb, in antimony telluride is

C2 A. 1 B. 2 C. 3 D. 4 281

Which element forms ions by losing electrons?

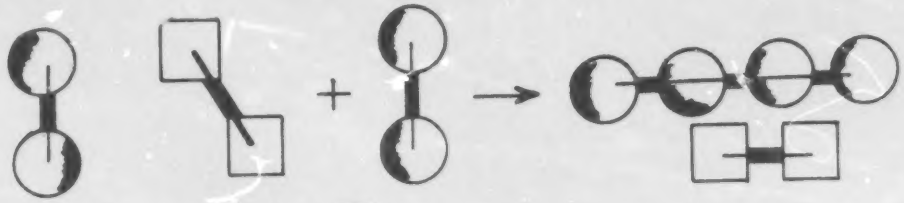
A. Chlorine.
D3 B. Nitrogen.
C. Oxygen.
D. Potassium. 282

Observe the following equation written in words and symbols.

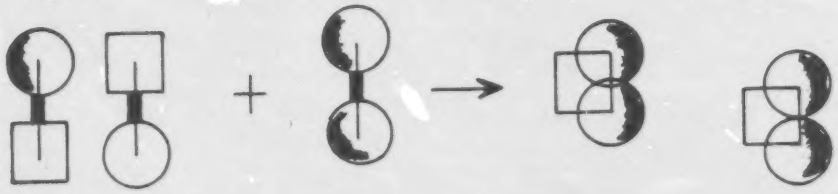
HYDROGEN + OXYGEN → WATER
$2H_2$ + O_2 → $2H_2O$

Which of the models below most clearly and correctly illustrates this equation?

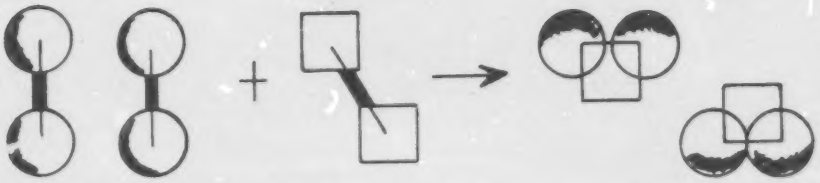
A.



B.



C.



D.

C3 283

What are the constituent elements in the compound with the chemical formula Na_2PO_3?

A. Nitrogen, Argon, Polonium, Osmium.
B. Sodium. Phosphorus. Oxygen.
C. Natrium. Potassium.
B3 D. Nobelium, Platinum, Oxygen. 284

How many *different elements* combine to form the compound nitrobenzene $C_6H_5NO_2$?

A. 4
B. 5
C. 13
D. 14

A3

285

How many *atoms of hydrogen* are needed to make one molecule of glucose $C_6H_{12}O_6$?

A. 2
B. 6
C. 12
D. 24

C3

286

Magnesium (Mg) atoms have 2 electrons in their outermost electron shell and fluorine (F) atoms have 7 electrons in their outermost electron shell. The formula for the compound formed from these elements would most probably be

A. Mg_7F_2
B. MgF_2
C. Mg_2F_7
D. Mg_2F

B1

287

The valency or combining power of aluminium is +3 and that of oxygen is -2. The formula for aluminium oxide would be

A. Al_2O_3
B. Al_3O_2
C. $Al^{3+}O^{3-}$
D. $Al^{2+}O^{3-}$

A2

288

Which gas below consists of *monatomic molecules?*

A. argon.
B. hydrogen.
C. oxygen.
D. sulfur dioxide.

A1

289

Which formula below is *incorrect?*

A. $MgCl_2$
B. $Al(OH)_3$
C. $Cu(CO_3)_2$
D. H_2SO_4

C2

290

Which equation correctly represents the reaction between sodium carbonate and nitric acid?

A. $2NaCO_3 + 2HNO_3 \rightarrow 2NaNO_3 + H_2O + 2CO_2$
B. $Na_2CO_3 + HNO_3 \rightarrow Na_2NO_3 + H_2O + CO_2$
C. $Na(CO_3)_2 + HNO_3 \rightarrow Na_2NO_3 + CO_2 + H_2O$
D. $Na_2CO_3 + 2HNO_3 \rightarrow 2NaNO_3 + H_2O + CO_2$

D1

291

Which equation represents a synthesis reaction?

A. $2H_2 + O_2 \rightarrow 2H_2O$

B. $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

C. $H_2SO_4 + Mg \rightarrow MgSO_4 + H_2$

A2 D. $Mg(OH)_2 \rightarrow MgO + H_2O$ 292

Which equation represents a decomposition reaction?

A $CaCO_3 + 2HCl \rightarrow CaCl + H_2O + CO_2$

B. $NaOH + 2HCl \rightarrow 2NaCl + H_2O$

C. $Ca(OH)_2 \rightarrow CaO + H_2O$

C3 D. $Mg + 2HCl \rightarrow MgCl_2 + H_2$ 293

Which equation correctly represents the reaction between carbon dioxide and limewater?

A. $CaO + CO_2 \rightarrow CaCO_3$

B. $H_2O + CO_2 \rightarrow H_2CO_3$

C. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

C2 D. $CO_2 + CaCO_3 \rightarrow Ca(OH)_2 + CaO$ 294

Which equation represents a combustion reaction?

A. $2Mg + O_2 \rightarrow 2MgO$

B. $SO_2 + H_2O \rightarrow H_2SO_3$

C. $Ca(OH)_2 \rightarrow CaO + H_2O$

A3 D. $H_2SO_4 + Mg(OH)_2 \rightarrow MgSO_4 + 2H_2O$ 295

Which equation correctly represents the electrolysis of water?

A. $2H_2 + O_2 \rightarrow 2H_2O$

B. $2H_2O_2 \rightarrow 2H_2O + O_2$

C. $2H_2O \rightarrow 2H_2 + O_2$

C2 D. $CO_2 + H_2O \rightarrow H_2CO_3$ 296

Which equation represents a neutralisation reaction?

A. $HCl + NaOH \rightarrow NaCl + H_2O$

B. $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

C. $2Mg + O_2 \rightarrow 2MgO$

A2 D. $Ca(OH)_2 \rightarrow CaO + H_2O$ 297

Which equation represents the decomposition of lead oxide to form lead and oxygen?

A. $6PbO + O_2 \rightarrow 2Pb_3O_4$

B. $2PbO \rightarrow 2Pb + O_2$

C. $2Pb_2O_3 + O_2 \rightarrow 4PbO + 2O_2$

B3 D. $Pb + O_2 \rightarrow PbO_2$

298

Which equation is correctly balanced by using the coefficients 2, 6, 2, 3 for each of the compounds respectively?

A. $Zn + HCl \rightarrow ZnCl_2 + H_2$

B. $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$

C. $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

D2 D. $Al + HNO_3 \rightarrow Al(NO_3)_3 + H_2$

299

Which coefficients below could be used to balance this equation?

$$Al + O_2 \rightarrow Al_2O_3$$

A. 6, 3, 3.

D2 B. 6, 3, 2.

C. 2, 3, 2.

D. 4, 3, 2.

300

Which equation is NOT balanced?

A. $H_2 + Br_2 \rightarrow 2HBr$

B. $Mg + 2HCl \rightarrow MgCl_2 + H_2$

C. $Zn + H_2SO_4 \rightarrow ZnSO_4 + 2H_2$

C2 D. $2CO + O_2 \rightarrow 2CO_2$

301

Which equation is correctly balanced?

A. $N_2 + 3H_2 \rightarrow 2NH_3$

B. $H_2 + O_2 \rightarrow H_2O$

C. $H_2 + Cl_2 \rightarrow HCl$

A3 D. $Cu + HNO_3 \rightarrow Cu(NO_3)_2 + H_2O + NO_2$

302

Which of the following atoms are not balanced in this equation?

$$CaCO_3 + HCl \rightarrow CaCl_2 + CO_2 + H_2O$$

D4 A. Ca B. O C. C D. Cl

303

LEFTOVERS

A vacuum is an ideal environment for preventing corrosion but rarely is practicable. Next best is a very dry environment, as in deserts or dehumidified warehouses. But if water cannot be excluded, oxygen should be, and a pH near 7 should be maintained. In view of this statement, which of the following environments would be the most suitable for preventing corrosion?

C2

A. Fresh water stream.
B. The Simpson Desert.
C. The Lunar surface.
D. The South Polar waters.

304

A charcoal fire in a closed room produces a highly poisonous gas. This gas is

B1

A. carbon dioxide.
B. carbon monoxide.
C. methane.
D. sulfur dioxide.

305

In which of the following towns or cities would you expect your car to 'rust out' most rapidly?

D4

A. Broken Hill.
B. Cooma.
C. Canberra.
D. Port Kembla.

306

Which of the following contributes most to air pollution?

D3

A. Aerial spraying of crops.
B. Bushfires.
C. Diesel engines.
D. Petrol engines.

307

When water is broken down, two gases are formed. These cannot be broken down further to give simpler gases. Each of these gases is a(n)

B3 A. compound. B. element. C. mixture. D. molecule.

308

Which group contains three materials found in the atmosphere?

D5

A. Carbon dioxide, carbon, nitrogen.
B. Nitrogen, oxygen, sodium.
C. Oxygen, mercury, carbon monoxide.
D. Carbon dioxide, nitrogen, oxygen.

309

Where a metal combines with a non-metal, the product is <u>always</u>

C2

A. an acid.
B. an alloy.
C. a compound.
D. a salt.

310

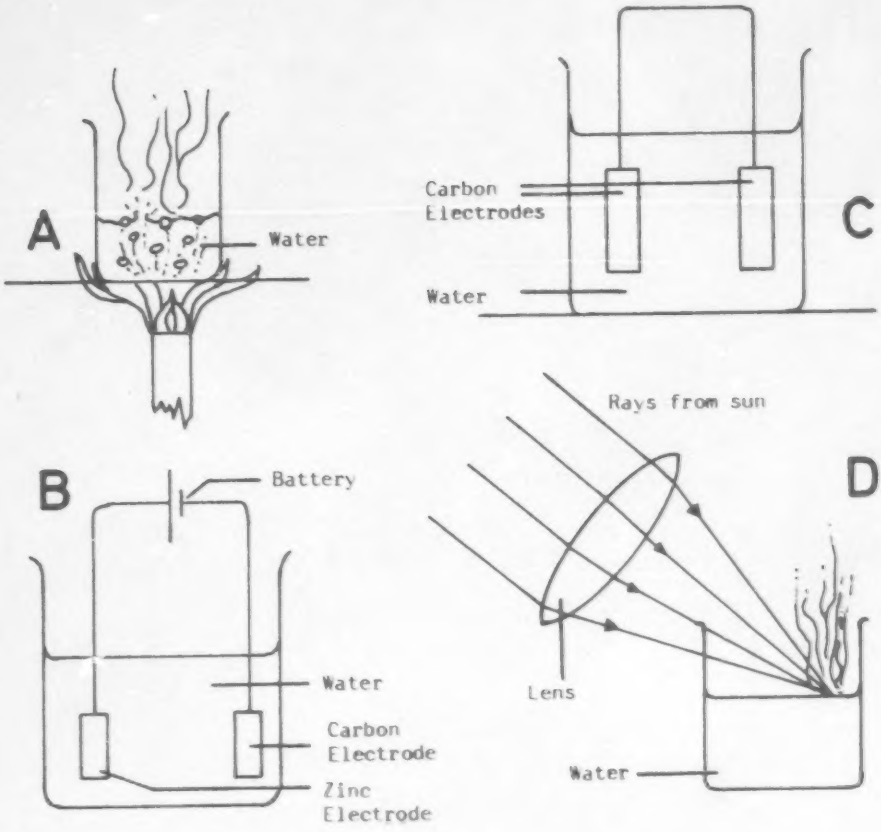
Silver nitrate solution reacts with sodium chloride solution to form a white solid of silver chloride which quickly drops to the bottom of the reaction mixture. The silver chloride forms the white solid because

A2

A. silver chloride is not soluble in water.
B. silver chloride is heavier than silver nitrate.
C. silver compounds are mostly white solids.
D. silver is a noble metal and so tends to return to its element state.

311

Which set of apparatus below is being used to carry out a chemical, rather than a physical change?



B2

312

A kitchen wood stove is smoking and giving off very little heat. The best method of reviving the fire would be to

A. add more wood to aid combustion.
B. add paper to increase the ignition temperature of the wood.
C. close the stove immediately for a short time to allow the temperature around the fire to increase.
D. open the draught to allow more air to circulate.

D3

313

A glowing match was dropped into a dry gas jar containing one gas only. The match (but NOT the gas) caught alight. The gas in the jar was most likely

A. carbon monoxide.
B. hydrogen.
C. oxygen.
D. propane.

C.3

314

The changes shown in the diagram above give a good representation of what we think happens when

A. a molecule of plastic forms.
B. a worm reproduces.
C. a crystal of salt dissolves in water.
D. a molecule of starch breaks up into sugar.

315

A3.

A glowing match was dropped into a dry gas jar containing one gas only. The match (but not the gas) caught alight. The gas in the jar must have been

A. carbon dioxide.
B. carbon monoxide.
C. hydrogen.
D. oxygen.

316

D3.

Limewater turns milky when carbon dioxide is produced. If different substances are burned in a gas jar and then tested with limewater, the substance which would NOT cause limewater to go milky is

A. candle. B. wood. C. butter. D. sulphur.

317

D2.

A piece of magnesium was heated in argon gas. The mass of magnesium used was 1.50 g, the mass of argon used was 3.00 g. After heating the magnesium was withdrawn and weighed. The mass of the argon left would have been 318

A. 1.50 g B. 2.25 g C. 3.00 g D. 4.50 g

C1.

An alka-seltzer tablet weighing 2 grams is added to a flask. Water is added and the flask is immediately sealed and weighed. Its weight was 200 grams. Bubbles form and the tablet disappears. The flask will now weigh

A. 200 grams.
B. slightly more than 200 grams.
C. slightly less than 200 grams.
D. 202 grams.

A3. 319

10 grams of a substance P is added to 50 grams of a liquid Q. A reaction takes place and after the reaction, the resulting solution R is weighed and found to weigh 57 grams. This reduction of 3 grams is due to

A. 3 grams of P being dissolved by liquid Q.
B. the molecules of R being smaller than those of P or Q.
C. 3 grams of a gas being lost during the reaction.
D. the molecules of P fitting between those of liquid Q.

320

C3.

A common laboratory experiment is to use a blowpipe to heat lead oxide on a charcoal block. After a short time a ball of lead forms on the block.

This experiment is similar to the way in which

A. iron is separated from iron ore
B. aluminium is obtained from bauxite.
C. impure copper is made pure.
D. iron is converted into steel.

A.1 321

The list below is of four chemical reactions which you would have seen in the laboratory.

P. Burning magnesium.
Q. Decomposing water with electricity.
R. Combining iron and sulfur.
S. Heating mercury oxide.

Remembering that endothermic reactions require energy to keep them going, then the two endothermic reactions are

A. P and R.
B. Q and S.
C. P and S.
D. Q and R.

B.1

322

Heating red mercury oxide causes it to form mercury and oxygen.

Such a reaction can be classed as

A. exothermic.
B. precipitation.
C. synthesis.
D. decomposition.

D.2

323

This is a test for the presence of silver in a solution:

I. dissolve some common salt in water.
II add salt solution to test solution.

A positive test for silver results in the formation of a thick, white cloud of silver chloride. If this is left to stand it settles to the bottom of the test-tube.

Such a reaction is called

A. exothermic.
B. endothermic.
C. precipitation.
D. synthesis.

C.2

324

Combustion in air is illustrated by

A. burning wood in a stove.
B. liquefaction of air.
C. heating lead oxide to form lead and oxygen.
13 D. changing crude oil into its different oils and petrols. 325

A fire will sometimes start spontaneously in a haystack. The most likely cause of this is the heat

A. of the sun shining directly onto the hay.
B. produced by decaying hay.
C. produced by static electricity in the haystack.
B1 D. produced by the evaporation of moisture from the hay. 326

Which of the following reactions involves the net release of heat energy?

A. Decomposition of lead oxide by carbon monoxide on a charcoal block.
B. The decomposition of lead oxide into lead and oxygen.
C. The formation of glucose from CO_2 and H_2O in the leaves of a plant.
D1 D. The combustion of magnesium in air. 327

Which of the following is a chemical change?

A. Melting of wax.
B. Mixing of iron and sulfur.
C. Burning of wood.
C1 D. Dissolving of sugar in water. 328

Which of the following is a physical change?

A. Burning wood. C. Iron rusting.
B3 B. Melting ice. D. Cooking a cake. 329

A chemical change always involves

A. a change in colour.
B. a change of state.
C. a new substance being formed.
C3 D. the release of heat. 330

It is dangerous to leave a motor car engine running in a closed garage because

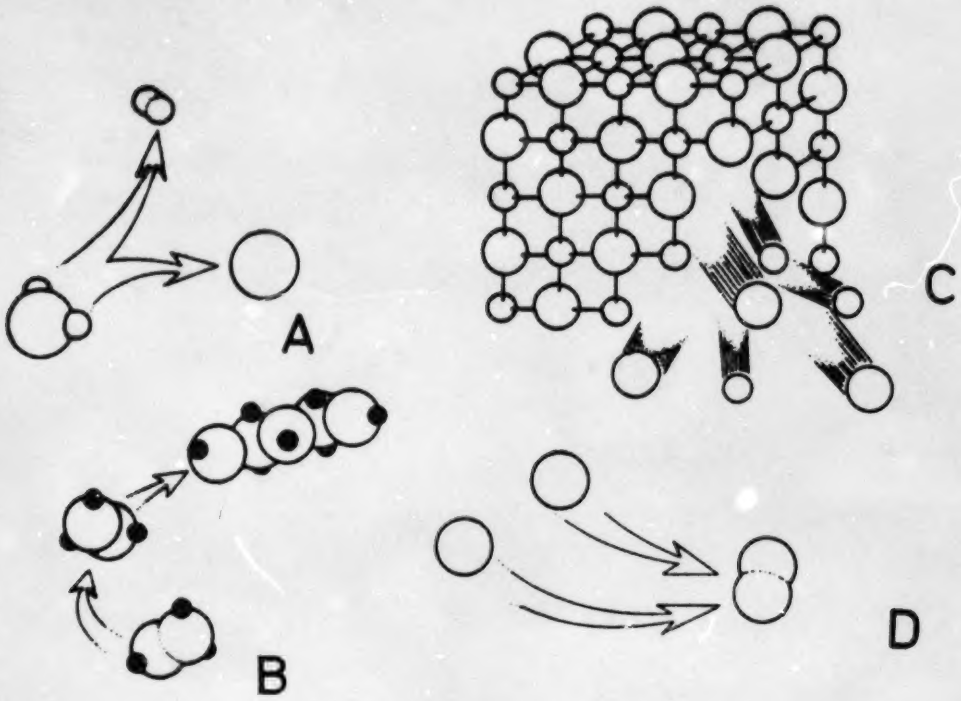
A. poisonous carbon monoxide gas is produced.
B. all the oxygen in the air is quickly used up.
C. an explosive mixture of gases is produced.
A5 D. spontaneous combustion is likely to occur. 331

Which of the following is NOT a property of basic solutions?

A. Affect indicators.
B. Neutralise acids.
C. Possess H+ ions as the only positive ions.
C1 D. Conduct an electric current. 332

The next two questions refer to the following information.

The following models represent different chemical processes.

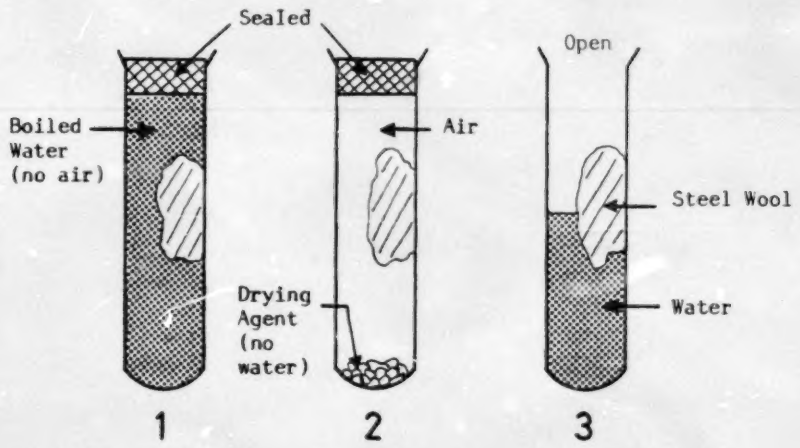


B2 Which model which best displays how a molecule of plastic forms? 333

C2 Which model best displays the process of sublimation? 334

The test tubes drawn below show the set-up of an experiment to study rusting.

It was noticed that the steel wool in tube 3 rusted while that in tubes 1 and 2 did not.



From this experiment you could conclude that

A. only air is necessary for rusting.
B. steel wool will rust in the presence of air and water.
C. substances will rust if water is present.
B5 D. steel wool and water combine to form rust. 335

Many chemical reactions occurring in excess water solutions will proceed more slowly if further water is added.
The factor causing this would be

A. a change in temperature.
B. a change in the concentration of the reactants.
C. the nature of the substances.
D. a change in the surface area exposed.

336

B3.

D. WEST, GOVERNMENT PRINTER, NEW SOUTH WALES - 1981